Indian Education for All

Model Teaching Units

Science - K- 8

Developed by Montana Educators and the Office of Public Instruction

Montana
Office of Public Instruction
Denise Juneau, State Superintendent

opi.mt.gov

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K-8

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Montana
Office of Public Instruction
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Model Teaching Units
Science
Grades K-8

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Montana Office of Public Instruction
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Science Model Teaching Unit
Rocks as Tools

Created by Marne Oaas

Kindergarten - Approximate Duration: 150 minutes

Stage 1 Desired Results

Established Goals

Science Content Standard 1: Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate results and reasonable conclusions of scientific investigations.

Science Content Standard 4 Benchmark 4.2: Describe and measure the physical properties of earth's basic materials (including soil, rocks, water and gases) and the resources they provide

Essential Understanding 1: There is great diversity among the 12 tribal Nations of Montana in their languages, cultures, histories and governments. Each Nation has a distinct and unique cultural heritage that contributes to modern Montana.

Understandings	Essential Questions
• Rocks have different textures, colors, weights, and uses as tools and structures. • Rocks are non-living (Western science define rocks as being non-living, however living and non-living is not defined in the same way for Indigenous science. Some cultures view rocks as living).	• How did people use rocks as tools long ago? • How do people use rocks as tools today?
Students will be able to… • classify rocks by attributes: flaky, crumbly, hard, soft, smooth, rough, colors, weight, etc. • demonstrate the use of rocks as tools; for scraping, mashing, crushing, sanding, cleaning, staining, etc.	*Students will know…* • rocks have different textures, hardness, weight and uses. • rocks have a variety of uses.

Stage 2 Assessment Evidence

Performance Tasks

- Students will collect, sort, and chart samples of rocks.
- Students will play the Rock Counting Game

Other Evidence

- Students will participate in class activities, discussions, and ask appropriate questions.

Stage 3 Learning Plan

Preparations

- Several weeks before beginning this lesson collect rocks you will need. You'll need a variety of assorted rocks. The teacher should crack open some rocks or find them split or cracked so the class can compare the inside to the outside.
- Collect pictures of tools made from rocks. A good place to find some is: http://mhs.mt.gov/education/footlocker/Prehistoric.pdf, on pages 4 and 5; you may also want to check this footlocker out from the Montana Historical Society. You may also find some appropriate images and resources at http://mhs.mt.gov/education/footlocker/ancientteachings.asp.
- Set up your "cooperative learning groups." Groups should be no larger than four students.
- Assemble "Rock Counting Game," one for each cooperative learning group.

Learning Activities

Introduction: Read and discuss "Tunka-shila, Grandfather Rock" (Lakota[Sioux]-Great Plains story) or "Old Man Coyote and the Rock" (Pawnee-Great Plains story). Both Stories can be found in "Keepers of the Earth Native American Stories and Environmental Activities for Children" by Michael J. Caduto and Joseph Bruchac. Another option is a contemporary Crow story in the book *I Am a Rock & My Name is Pop*, distributed to all elementary school libraries by OPI.

1. Brainstorming activity: Ask and record answers from a discussion using the following questions as a guide. Record on a large poster or piece of paper.
   "What is a rock?"
   "Do you think rocks are living or non-living?"
   "How have people used rocks in the past?"
   "How do we use rocks today?"
   "How do these Native American stories present rocks."
   "Are the rocks considered living or non-living within the stories?"
2. Extend the discussion on rocks as living or non-living things. Explain that in the Pend d'Oreille and Salish perspective, the Creator is present in all things. Everything has a purpose, and anything with a purpose is considered to be living. See pages 8 and 9 of "A Brief History of the Salish and Pend d'Oreille Tribes." (Available from the Salish & Pend d'Oreille Culture Committee.)
3. Vocabulary: With the students, make a list of words that describe rocks. Post the list in the classroom.
4. Display the gathered rocks and get student input on ways to describe the rocks. How are they the same or different? Discuss the properties of rocks (size, shape, texture, color). Referring back to the posted list. Give each child a brown lunch bag to bring to class 1-3 small (not too small) or medium-size rocks. They can also find rocks outside in the school yard. Add students' rocks to class collection.
5. Give each group of students a bin of rocks to explore and sort. They can sort by size, shape, texture, color. Have students chart and draw the sorted rock types, count, and label how many of each type they have in their container. Remind them to use the posted list as a reference. Walk around and monitor/discuss with the groups how they are sorting their rocks.
6. Using a variety of objects (nails, plastic picks, cloth, small stiff brushes, etc.) let the students pick, poke, and explore the attributes of the rocks to determine if they are hard, soft, crumbly, smooth, rough, different on the inside when cracked open, etc. Add to the classroom list more ways to describe rocks.

Science Kindergarten Rocks as Tools (continued)

7. Rocks as Tools – students will brainstorm and discuss the use of rocks as tools. Have pictures or actual tools for students to view. Pass around the pictures of indigenous' tools made from rocks or project the Montana History Societies' website photos. What were the tools used for and what type of rock would be best for that use? Hammering, pestles, scraping, mashing, scrubbing, cutting, cooking, etc.
8. Students will pick a rock and decide how it could be used as a tool. If possible have the children actually use the rocks as tools to scrape, mash, pound, etc.
9. Students will classify the tools by how they would be used.
10. Optional: Continue exploring the American Indian Traditional uses of the environment by inviting a tribal representative to demonstrate ancestral skills and technology.

Closing activity: Rock Counting Game (using pebbles as math tools)

Materials: Five smooth pebbles. Paint a half moon shape on one side of each of four pebbles and a star shape on one side of the remaining pebble. Pea gravel and paper cups for keeping track of points.

Play: Place the pebbles in a container (shoe box or a basket).
Let one child at a time hold the basket and give it a shake.
Then have the child count the number of shapes that turn up.

Scoring: You can have a point system game by allotting one point for each moon and two points for the star. Children can use pea gravel placed in a paper cup to keep track of their points.

Who Wins: After each child has five turns they count their pea gravel counters. The one with the most gravel wins. First one to a given number wins.

Materials/Resources Needed

- A good mix of rocks for student use
- Large nails, plastic pick, cloth, small, stiff brushes, etc.
- Plastic bins/boxes to hold sets of rocks
- Pictures of stone tools
- *Keepers of the Earth Native American Stories and Environmental Activities for Children* by Michael J. Caduto and Joseph Bruchac
- *I Am a Rock & My Name is Pop*, distributed to all elementary school libraries by OPI.
- "A Brief History of the Salish and Pend d'Oreille Tribes" by the Salish-Pend d'Oreille Culture Committee of the Confederated Salish and Kootenai Tribes, Salish-Pend d' Oreille Culture Committee, 81 Blind Barnaby Street, P.O. Box 550, St. Ignatius, Montana 59865
- Montana History Society "Prehistoric Life in Montana" resource trunk http://mhs.mt.gov/education/footlocker/Prehistoric.pdf
- Materials for one Indian counting game
- 5 smooth pebbles: 1 with a star painted on one side, 4 with a moon painted in each side
- 1 container for the smooth pebbles
- A handful of pea gravel for scoring
- 1 small container or paper cup for each player to put their pebbles in

Extending the Lesson

This basic lesson can be extended to include exploration of sand and soil/dirt found in local landscapes as a place-based connection.Students could grind stones together to see if they can make sand. They could also use sand to scrub cloth and other materials to see the effects.Students could try dyeing cloth with red dirt. The extension on soil/dirt could also introduce the concept of how soil/dirt is made from rocks and sand.

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Science Model Teaching Unit
Day and Night

Created by Lucy Jensen

Grade 1 - Approximate Duration: 120 minutes

Stage 1 Desired Results

Established Goals

Science Content Standard 4: Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.
Benchmark 4.6: Identify objects (e.g., moon, stars, and meteors) in the sky and their patterns of movement and explain that light and heat comes from a star called the sun.

Essential Understanding 3: The ideologies of Native traditional beliefs and spirituality persist into modern day life as tribal cultures, traditions, and languages are still practiced by many American Indian people and are incorporated into how tribes govern and manage their affairs.

Additionally, each tribe has its own oral histories, which are as valid as written histories. These histories pre-date the "discovery" of North America.

Understandings	Essential Questions
• The Sun is a Star, a hot ball of gas producing heat and light. • The planet we live on is Earth. • The Earth spins or rotates. • Earth moves around the Sun; the Sun does not move. • One complete rotation of the Earth takes 24 hours, causing daytime and nighttime. • The Sun is always shining. • Earth's own shadow causes the dark of night.	• What is the name of the planet we live on? • Why is it light outside during the day? • How are Earth and the sun different? • What do we see in the sky at night? • Why don't we see the stars during the day? Where do they go? • Why do we see the sun during the day? • Where is the sun during different times of the day? • Where is the sun at night? • Why is it dark at night? • How can the sun shining in a tipi be a way of telling time?

Science Grade 1 Day and Night (continued)

Students will be able to…	*Students will know…*
• demonstrate the Earth rotating on its axis. • exchange ideas of what happens during the nighttime and daytime regarding the Earth and the sun. • determine the natural cycle of day and night. • relate the idea of light and shadow to day and night?	• key terms: Earth, sun, rotate, cycle, light, shadow • the sun is a star; the Earth is a planet. • the Earth moves, the sun does not. • a day is 24 hours – one rotation of the earth. • The Earth turning creates a pattern/cycle. • how some Crow people tell time by the position of the sun in the tipi.

Stage 2 Assessment Evidence

Performance Tasks

- Students will demonstrate knowledge using a KWL chart.
- Students will create a pattern with pattern blocks and student created pictographs, relating to the day and night cycle.
- Students will write and illustrate a day/night book of two opposite locations in the world.

Other Evidence

- Observation of student in lab activity
- Participation in class discussions
- Individual questioning of students

Stage 3 Learning Plan

This kinesthetic, active format will appeal to all learning styles from the lab of rotating around the sun to creating the pattern cycles of the day and night. The last activity will demonstrate the students' understanding of the sun always shining as the students create a "Where in the World" flip book.

Day 1

- Students will begin the lesson with a KWL chart.
- Everything they "Know" about day and night will be written in the first column in a class discussion and everything they "Want to Know" in the second column.
- Students will complete the last column "What I Learned" at the end of the lesson.
- Read to the class, How Chipmunk Got his Stripes. (Iroquois, Cherokee, Mohawk, & Abenaki Versions)
- Discuss how this teasing game of Brown Squirrel and Bear wasn't good for either animal.
- Why wasn't Bear able to keep the Sun down?
- Demonstrate the rotation of the Earth (room may need to be darkened prior to lesson)
- One student becomes the sun using a flashlight or lamp.
- Discuss - what is the sun?
- Demonstrate the sun's heat and light with the lamp/flashlight.
- Another student becomes the Earth. Discuss the Earth's location compared to the sun.
- Position the "earth student" two feet away from the "Sun student."

- Discuss what do we see moving in the sky? Explain the Earth, the planet, is moving not the sun.
- Demonstrate the clockwise rotation of the Earth.
- The "Sun" student will have the lamp shining straight ahead at the "Earth student
- The "Earth" student will slowly rotate clockwise one time around moving over only slightly.
- Students will then participate in an activity demonstrating the Earth's rotation. (Discuss how scientist use models to represent nature.)
- Students will draw a quick figure of themselves in the center of a paper plate. This picture represents them standing on the Earth in their own home town.
- One student at a time rotates slowly clockwise, the sun shines on the "Earth" student.
- Classmates are observing and calling out the daytime and nighttime. What pattern is noticed? (The light shines on the right side of the Earth 1st.)
- Students will next track the light by when they think the sun is rising on their person on the plate and when the sun is setting. How can they tell? What pattern is being created, how do we know?
- The class will observe the light on the plate of "Earth" and will say out loud as it happens; sunrise, day, sunset, and night as the Earth rotates three times around.
- Students will demonstrate their understanding on the day and night cycle by drawing a pattern design to represent sunrise, day, sunset, and night with pictographs of suns and moons, or other pictures of their choice.
- Depending on student ability, some students may graph only the day and night cycle. An enrichment activity can be done by students adding noon and midnight to their pattern.
- Allow time for students to discuss and share their patterns.
- Display students' cycle patterns on the wall for reflection and further evaluation. Students will recount what is occurring in the cycle and how it relates to the Earth and the Sun.

Day 2

- Review the motion of the sun using the lamp and planet Earth student.
- Allow time for students to discuss what they learned yesterday and repeat again for understanding and for students who may have been absent.
- Review KWL chart, add any new thoughts, ideas, or insights to the poster. (Address misconceptions)
- What would be a better model of the Earth than our paper plate? With the globe now representing the Earth, find the general location of your school's town. Mark the location on the globe with a sticker.
- What is happening to the light when we are in darkness? Allow time to test theories.
- Discuss how we are sharing the light when we are in our nighttime cycle –the light is now with other people on the other side of the world.
- Observe how the Earth's own shadow creates the night.
- Locate another town on the other side of the world.
- Run the student model of the Earth to observe the pattern of these two different towns during one Earth rotation.
- Check sunrise/sunset Web site to confirm student theories. Brainstorm what people might be doing in the other location when we are experiencing daytime.

Day 3

- Read "Teepee, Sun, and Time;" which tells how the Crows can tell time based on the sun's position inside a tepee. Discuss how this relates to the movement of the Earth in a one-day rotation.

Tips for teachers

- Make sure lights are working properly
- Keep all lab items together in a container for easy dispersal.
- Keep in mind time allotment and record for next use.

Resources

Books

"How Chipmunk Got His Stripes. 2001", color illustrations From Joseph Bruchac (Abenaki) and James Bruchac (Abenaki)

Web sites

Sunset and Sunrise Times Around the World
www.gaisma.com
Teepee, Sun, and Time. 1972 Real Bird, Henry. The Indian Reading Series.
http://www.nwrel.org/indianed/indianreading/index.html

Copies of the book may be downloaded from the Northwest Indian Association Web site (check with your local school librarian for the printed copy sent out by the Office of Public Instruction).

Materials/Resources Needed

- Darken room - may need paper to cover windows
- Lamp/flashlight
- Paper plates
- Globe

Two stickers for globe "towns"

Cover for Student Flipbook
Make one copy for each student.

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Science Model Teaching Unit
What's for Dinner

Created by Lucy Jensen

Grade 1 - Approximate Duration: 120 Minutes

Stage 1 Desired Results

Established Goals

Science Content Standard 3: Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.
Benchmark 4.2: Identify, measure, and describe basic requirements of energy and nutritional needs for an organism.

Essential Understanding 3: The ideologies of Native traditional beliefs and spirituality persist into modern day life as tribal cultures, traditions, and languages are still practiced by many American Indian people and are incorporated into how tribes govern and manage their affairs.
Additionally, each tribe has its own oral histories, which are as valid as written histories. These histories pre-date the "discovery" of North America.

Understandings	Essential Questions
• The basic needs for all animals are food, water and shelter. • **Interactions** are part of this natural system between predator and prey. • **Carnivores** are the creatures which must catch and kill their food to survive. They are meat eaters. • **Herbivores** are the plant eaters in the environment.	• Key Terms: Interactions, Carnivores, Herbivores, and Omnivores • What are the basic needs of all animals? • How do animals fulfill basic needs? • How do different animals interact with each other? • How can we group animals by what they eat? • What are the differences and similarities of a carnivore, herbivore, and omnivore?
Students will be able to… • identify the basic needs of animals as food, water and shelter. • tell how the basic needs are met in different ways by different animals in native stories. • introduce Blackfeet names of eight Montana animals. • identify herbivores, carnivores, and omnivores. • create a story line for an animal relationship in a class discussion.	*Students will know…* • Key Terms- basic needs, carnivore, herbivore, omnivore, interactions • herbivores eat plants, carnivores eat meat, and omnivores eat both plants and meat. • the relationship between carnivores, herbivores, and omnivores.

• create a Montana animal from the class list, label it with its Blackfeet name, and identify its group (herbivore, carnivore, or omnivore).	

Stage 2 Assessment Evidence

Performance Tasks

Students will compare and contrast the roles of animals in American Indian stories through discussion of animal eating behaviors.

- Students will sort pictures of animals into herbivores, carnivores and omnivores groups.
- Each student will be able to name an herbivore, carnivore and omnivore through classroom discussion.
- Students will create a Montana animal which they make from clay. Each animal will be labeled with its Blackfoot name and classification: herbivore, omnivore, or carnivore.
- Students will present their clay animals to other classrooms of the same age or younger, explaining what the animal eats and why it is classified as a herbivore, carnivore, or omnivore.

Other Evidence

- Students will be observed as they organize the classification groups of herbivores, carnivores, and omnivores.
- Participation in class.
- Individual questioning of students.

Stage 3 Learning Plan

Through ongoing class discussions and activities students will develop an understanding of the basic needs and the different roles that the animals play in the food chain. Students will identify animals in American Indian stories as herbivore, carnivore, or omnivore.

Resources

Animal pictures from Montana Fish Wildlife and Parks http://fwp.mt.gov/fieldguide/ for Black Bear, Badger, Mule Deer, Red Fox, Red Squirrel, Mountain Cottontail, Gray Wolf, and Mountain Lion
All animals are known to live in the area of the Blackfeet Indian Reservation.

Animal Cards, Animal Photos (badger and black bear provided courtesy of Bernie Smith), and Venn Diagram Cards (all attached)

Watch for a set of audio files containing the traditional Blackfeet pronunciations for each animal. Check for it within the "Curriculum" area of the OPI Indian Education website (http://opi.mt.gov/indianed2/CurrSearch/Index.html).

Stories
These storybooks can be found at
http://www.oyate.org/catalog/preschool3.html

Thomason, Dovie (Lakota/Kiowa-Apache), "The Animals' Wishes." 2000, color illustrations; Iroquois.

Savageau, Cheryl (Abenaki), "Muskrat Will Be Swimming." 1996, color illustrations; Seneca.

Sockabasin, Allen (Passamaquoddy), "Thanks to the Animals." 2005, color illustrations by Rebekah Raye.

Classroom map of Montana Indian Reservations http://nris.state.mt.us/gis/gisdatalib/downloads/ab9.gif

Contact Information on pronunciation of the Blackfeet:
For guidance on correct pronunciation of the Blackfeet language contact their Tribal Education Department (406-338-7538), Blackfeet Community College (406-338-5441), or Browning Public School District #9 Native American Studies (406-338-2715) and ask for their Blackfeet Language instructors.

Day 1
Teacher will lead students in a brainstorming activity, thinking of different animals in their local area. Students will discuss the basic needs animals for shelter, food, and water. Using this information, students will predict how their selected animals meet those needs based on what they know about the animals' habitats.
All ideas and information will be recorded on chart paper.

Ask the question, "What are an herbivore, a carnivore, and an omnivore?" Clarify any misconceptions and provide a correct definition. Return to the chart of information and ask students what foods each animal eats. Using this feedback, students will classify the animals listed as carnivore, herbivore, or omnivore.

As students listen to selected American Indian stories they will identify what different animals are eating. Using this information, students will classify each animal as an herbivore, carnivore, or omnivore, and discuss how they know.

Display and sound out Venn Diagram cards then place them on the ground. Use hula hoops to create a Venn diagram on the floor. Place the titles: herbivores on one inside, carnivores on the other inside, and omnivores in the center where the circles overlap.

Using the map of Montana Indian Reservations students will locate the Blackfeet Indian Reservation.
Place the eight Animal Cards and/or photos on the floor outside of the hula hoops. Explain that each animal is known to live on or near the Blackfeet Indian Reservation. Students will select a card, sound out the English and view the Blackfoot name of the animal, then discuss if the animal has the characteristics of an herbivore, omnivore, or carnivore. Students will then select a location in the Hula Hoops determining if the animal is an herbivore, carnivore or omnivore and place the card inside the hula hoops.
Teacher will provide students with the pronunciations of the Blackfeet words.

Look again at the Venn diagram created by the hula hoops and discuss the characteristics of the different groups. Check for any animals that have been placed in the wrong group and make adjustments, if any changes of animal location should be made. Locate and discuss, as a class, what group man should belong to on the diagram.

Science Grade 1 What's for Dinner (continued)

Students will create in groups, a story line for how one animal in one part of the diagram has a relationship with another animal in a different section. (How would the rabbit's life be connected to the wolf?) Students may role-play how the animal maintains its place on the diagram. (I am a wolf; I have sharp teeth for ripping and sharp claws for catching my food. I eat meat.)

Allow time to review concepts of the lesson as follows: Students will divide up into sets of two and give a quick sentence report to the classroom on "what I learned today."

Day 2
Students will be instructed to create a clay sculpture modeled after one of the animals from the Venn diagram. Recipe for clay follows.
Students will place an amount of clay, about the size of a baseball, on a cardboard base for sculpting. Allow students to create sculptures with a partner if preferred.

Day 3
Students will paint sculptures when they have dried; color choices are up to the student. Student clay sculptures will include the animal's Blackfeet name, English name, and classification name (herbivore, carnivore, or omnivore).

Students will practice then share their information in a short oral presentation stating the classification of his/her animal and the qualifications for placement in a classification. Students will present their clay animals to their own class and other classrooms. (Same age or younger aged class is best for first grade.)

Bring in traveling trunks of mammals for enrichment.
http://www.ZooMontana.org educational trunks

Pace of the lesson and time allotment will vary according to class.

Extension Activity
Access the set of audio files containing the traditional Blackfeet pronunciations for each animal. Check for it within the "Curriculum" area of the OPI Indian Education website (http://opi.mt.gov/indianed2/CurrSearch/Index.html).

Materials/Resources Needed
Be prepared by creating a checklist for all materials, have items ready before class, and keep them in one location for easy use throughout the lesson.
Native American stories
Montana Reservation maps
2 Hula Hoops
Pictures of animals with native names
Modeling clay [Magic Modeling Goop works well – "recipe" below]
5" by 5" cardboard squares for sculpture base
paint/brushes for painting finished sculptures

Magic Modeling Goop Recipe
2 cups table salt
2/3 cup water
1 cup cornstarch (loose)
2/3 cup water
Mix salt and 2/3 cup of water in saucepan, stirring until mixture is well heated, 3 or 4 minutes. Remove from heat and add cornstarch which has been mixed with 2/3 cup water. Stir quickly. If it does not thicken, return to low heat and stir until thick. It is hard to stir but undercooking leaves it sticky. It should form a soft, pliable mass. It can be kept in a jar or plastic bag-does not need refrigeration.

VENN DIAGRAM TITLES

Herbivores	**Carnivores**
Omnivores	

ANIMAL CARDS

Black Bear

Sikohkiaaya nan

Image used with used with permission of Montana Fish, Wildlife & Parks.

Badger

Siinaisskinan

Image used with used with permission of Montana Fish, Wildlife & Parks; photo by B. Smith.

Mule Deer

Awatoyinan

Image used with used with permission of Montana Fish, Wildlife & Parks; photo by S. Carson.

Red Fox

máóhkataatoyi

Image used with used with permission of Montana Fish, Wildlife & Parks; photo by C. Jourdonnais.

Red Squirrel

Miiyattsihayinan

Image used with used with permission of Montana Fish, Wildlife & Parks; photo by S. Carson.

Rabbit

Sikaaattsistaa

Image used with used with permission of Montana Fish, Wildlife & Parks; photo by S. Carson.

Gray Wolf

Omahkapisinan

Image used with used with permission of Montana Fish, Wildlife & Parks.

Mountain Lion

Omahkatayo

Image used with used with permission of Montana Fish, Wildlife & Parks; photo by R. DeSimone.

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Science Model Teaching Unit
There is a Season

Created by Roni Hawkins

Grade 2 - Approximate Duration: 120 minutes

Stage 1 Desired Results

Established Goals

Science Content Standard 4: Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.
Benchmark 4.5 Identify seasons and explain the difference between weather and climate.

Science Content Standard 5: Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.
Benchmark 4.5 Identify how the knowledge of science and technology influences the development of Montana American Indian cultures.

Essential Understanding 1: There is great diversity among the 12 tribal Nations of Montana in their languages, cultures, histories and governments. Each Nation has a distinct and unique cultural heritage that contributes to modern Montana.

Essential Understanding 3: The ideologies of Native traditional beliefs and spirituality persist into modern day life as tribal cultures, traditions, and languages are still practiced by many American Indian people and are incorporated into how tribes govern and manage their affairs.

Additionally, each tribe has its own oral histories, which are as valid as written histories. These histories pre-date the "discovery" of North America.

Essential Understanding 6: History is a story most often related through the subjective experience of the teller. With the inclusion of more and varied voices, histories are being rediscovered and revised. History told from an Indian perspective frequently conflicts with the stories mainstream historians tell.

Understandings	Essential Questions
Students will understand… • the differences in weather of the four seasons. • in what month each season begins. • Seasonal Rounds of the Salish of Montana.	• What are the four seasons? • What are different ways that we determine when each season starts and ends? • How do some Salish people determine when each season starts? • What activities take place during the Salish seasonal round

Science Grade 2 There is a Season (continued)

Students will be able to…	*Students will know…*
• name the four seasons. • name the months on the European calendar that is used in most schools, and which month each season begins. • the seasonal rounds of the Salish and the activities that take place during each Round.	• the seasons of spring, summer, winter, and fall. • the months on the European calendar when each season is noted as starting. • how some Salish understand what signals the change of seasons. • the activities that occur during each season for some Salish people.

Stage 2 Assessment Evidence

Performance Tasks

Students will be working in cooperative groups to create posters or collages. Groups will create posters to depict activities that take place during the different times of the year. These activities will come from their own experiences and from the seasonal rounds of the Salish. Each group will present their posters to the class to share the information they learned.

Stage 3 Learning Plan

Activity 1

Introduce students to the concept that our year is broken into four distinct periods, referred to as seasons, which mark different weather patterns as well as different activities. Students will be learning about these seasons from western European perspective, as well as the perspective of the Salish Tribes of Montana.

On the board or chart paper, make four columns. Ask if students can name any of the seasons before you write the names to pre-assess student background knowledge. Note the names on the side of the chart. Add any missing seasons to the side notes. Students will help you decide the column headings for Spring, Summer, Winter, and Fall in the order that they occur. Explain to students that the seasons are the periods/patterns of weather that make up our year. To further assess student background knowledge, ask for information that students know about the weather during each season. Record all answers on chart paper. As a class make adjustments or add further information generated by class discussion.

Ask students how a calendar can give us information about the seasons. Have students explore a western European calendar. In pairs have students look at each month. Students will record what they notice, especially if they find information about the seasons. Share out and chart their collected observations and information. Ask if there might be other kinds of calendars or ways of keeping track of the seasons.

Explain that many cultures in the world traditionally did not use a written calendar to identify each season. In Montana, the Salish tribes looked at a year in terms of what is known as a seasonal round. Explain to the students they will be looking at the seasonal rounds of the Salish Tribes of Montana.

Activity 2
Read the following to the students:

> *The Salish practiced a seasonal round of hunting and gathering. The tribes annually harvested hundreds of plants for food, medicines, personal hygiene, household goods, and tools. Tribal knowledge of the land and its resources informed the seasonal activities and elders say that the earth provided everything that they needed. The modern Salish calendar is a reflection of the seasonal round that the people practiced for generations.*
> (Excerpt taken from "Challenge to Survive: History of the Salish Tribes of the Flathead Indian Reservation," Unit 1, page 1.)

This introduces how the Salish used the environment to determine their yearly activities. Refer to the above-mentioned book to read about specific activities during each season. (This book was provided to all school libraries in Montana from the OPI.) Read the story of the bitterroot on pages two and three. It tells the story of how the bitterroot came to the Salish people and why it is so important.

(For more background knowledge, it is suggested that the teacher read pages 1-17 prior to the lesson to get a better understanding of the background of the Salish Seasonal Rounds.)

Explain to the students they are going to look at the Salish Calendar and the names they gave to months. Hand out copies of the **Salish Calendar,** found on page 18 of *Challenge to Survive: History of the Salish Tribes of the Flathead Indian Reservation*. If you have copies of the actual Salish Calendar use those with or instead of the list. Ask students what they notice about the Salish calendar names.

Students will view the DVD **Seasons of the Salish.** As students view the DVD stop periodically to chart what activities students notice that happen at each time of the year. When the DVD is done have students use their **Salish Calendar** lists to compare to their charted responses. Discuss what the list and DVD show us about how the Salish people developed a calendar and why it is called a seasonal round. How does the seasonal round reflect what the Salish understood about the world in which they live?

As a class, have students make a list of activities they know for each season of the year. Prompt them to include Salish activities. Students will work in groups of 2-4 to create posters from the class list of activities for each season of the year. The posters should include those that come from their personal experiences as well as those they've learned about from the **Salish Calendar** and **Seasons of the Salish.** After the posters have been made, each group will present to the class.

The Poster
Here are some guidelines to share with the students for what is required on their poster. You may also refer to the rubric included for grading purposes.

- Pictures need to be drawn, cut out of magazines, and printed off the computer. To encourage the use of different mediums, require the use of all of these. (If students do not have access to printing from a computer, this may be omitted.)
- Each season needs to be clearly labeled. You may want to show students an example of how to divide their paper so they have four distinct sections.

- Each person needs to contribute at least one picture to receive credit for the project.
- Each season needs to have at least four activities.

The Presentation
- Each student in the group will need to take a turn to present.
- Presentations are to be short and simple, just share what pictures/activities were included in the poster.

Assessment
Use rubrics to assess posters and presentations.

Materials for Poster Activity
- Large pieces of construction paper or easel paper
- Magazines for clipping pictures
- Markers and/or crayons
- Glue
- Scissors
- Drawing materials

Resources
Books
- "Challenge to Survive: History of the Salish Tribes of the Flathead Indian Reservation: Unit 1." Pablo, MT: Salish Kootenai College Press, 2008, distributed by OPI to all Montana schools.
- "Seasons of the Salish" DVD. Produced by Confederated Salish and Kootenai Tribes' Tribal Preservation Office and distributed by OPI to every elementary school libraries. It is also included in the *PlaceNames: Building Worldviews Using Traditional Cultures and Google Earth,* distributed by OPI to every middle and high school library.

Seasons Poster and Presentation Rubric

						Score
Seasons						
	All four seasons are included	4	3	2	1	
	Each season clearly labeled	4	3	2	1	
Pictures						
	Different mediums included(drawn, cut, computer)	4	3	2	1	
	At least four pictures per season	4	3	2	1	
Participation						
	Each student has contributed to poster	4	3	2	1	
	Each student presents during presentation	4	3	2	1	
					Total	

Seasons Poster and Presentation Rubric

						Score
Seasons						
	All four seasons are included	4	3	2	1	
	Each season clearly labeled	4	3	2	1	
Pictures						
	Different mediums included(drawn, cut, computer)	4	3	2	1	
	At least four pictures per season	4	3	2	1	
Participation						
	Each student has contributed to poster	4	3	2	1	
	Each student presents during presentation	4	3	2	1	
					Total	

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Science Model Teaching Unit
Animal Adaptations

Created by Lucy Jensen

Grade 3 - Approximate Duration: 90 minutes

Stage 1 Desired Results

Established Goals

Science Content Standard 3: Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.

Essential Understanding 3: The ideologies of Native traditional beliefs and spirituality persist into modern day life as tribal cultures, traditions, and languages are still practiced by many American Indian people and are incorporated into how tribes govern and manage their affairs.

Additionally, each tribe has its own oral histories, which are as valid as written histories. These histories pre-date the "discovery" of North America.

Understandings

- Adaptations are the physical and behavioral traits that help animals survive.
- Adaptation interactions are part of this natural system between predator and prey.
- Camouflage is one form of offensive and defensive adaptation used by both predator and prey.
- The true name of the Crow tribe is Apsáalooke, which means Children of the Large Beaked Bird (refer to the first paragraph of http://lib.lbhc.cc.mt.us/history/1.00.php for more specific information).
- **Camouflage** is the act of concealment, to blend in with the surroundings.
- **Predator** is an animal that hunts other animals for food.
- **Prey** is a creature that is hunted by a predator.

Essential Questions

- Key Terms; predator, prey, adaptation, survival
- What do animals need to survive?
- How do different animals interact with each other for this survival?
- What are the differences and similarities of a predator and its prey?
- What is camouflage?
- How does camouflage benefit the prey?
- How does camouflage benefit the predator?
- How did the spots from the earth help the fawn in the story?
- What other special adaptation does the fawn have besides the camouflage?
- How do the Apsáalooke name the birds of prey?
- Are these birds of prey adaptations more offensive or defensive? How do you know?
- Which color was the best camouflage for the outdoor activity, why?

Science Grade 3 Animal Adaptations (continued)

Students will be able to…	*Students will know…*
• identify what creature is a predator and what creature is prey. • identify the different animal adaptations in selected Native American stories. • identify Apsáalooke names of four Montana birds of prey and their meaning. • explain the use of camouflage by prey and predators. • graph the different colors of camouflage from the student "food find" outdoor lab. • identify offensive and defensive adaptations.	• Key Terms; adaptations, predator, prey, Apsaalooke, camouflage, survival • the Apsáalooke is the true name of the Crow tribe. • the Apsáalooke were early observers of the natural world and named creatures by these observations. • adaptations are traits that help an animal survive. • both Predator and Prey have adaptations. • adaptations can be offensive and defensive. • one form of adaptation is camouflage, the ability to blend in with the surroundings.

Stage 2 Assessment Evidence

Performance Tasks

Students will compare and contrast animal adaptations in selected Native American stories through discussion of predator and prey behaviors and physical features. These stories are listed under "Resources."

Each student will be able to give an example of an offensive and a defensive adaptation.

Students will create a collage using prey or predators' pictures, grouping them by their adaptations.

Students will read the Apsáalooke name and their meaning for four birds of Montana.

Students will graph the results of camouflage color found in the outdoor lab.

Other Evidence

Students will be observed as they organize the groups of predator and prey adaptations.
Student graphs will be assessed for accuracy of camouflage data based on the lab.
Participation
Individual questioning of students.

Stage 3 Learning Plan

Through ongoing class discussions and activities students will develop an understanding of animal adaptations and the different roles that the animals play in the predator/prey relationship. Students will see that the Apsáalooke are similar to scientists by utilizing detailed animal observations.

Day 1

The teacher will lead students in a brainstorming activity, thinking of the different ways animals survive in the wild. Next, the class will read Native American stories of animals and how they acquired their different adaptations. Students will identify and discuss how these adaptations help the animal whether it is a predator or a prey, to survive in the wild.

Then students are arranged into small groups. Students will need wildlife magazines, posters, and calendar pictures to be available to them for collaborating in small groups. Students will be creating two types of collages. One poster will be of predators and the other for prey creatures. After the posters are completed, students will identify what special adaptation each animal has as a prey or predator that helps it with its survival in an oral report to the class.

Next, the class will arrange all of the predator posters into one large group and the prey posters into another group. Divide the class into prey or predator and go to the appropriate set of posters. Here each group will create and display a written list of adaptations they see on their set of posters. Looking as these newly generated lists the class will compare which of these adaptations are represented on both, predator and prey posters. "What do these two groups have in common?" The teacher will then introduce the concept of offensive (predators) and defensive (prey) adaptations. Students will pick two adaptations they observe on each chart and write each one on a sticky note. They will discuss how these adaptations can be offensive and defensive with their classmates. Each sticky note will then be placed on the chart, "Adaptations: Offensive and Defensive."

Day 2
Food Find Lab
Materials:
pencils
Work sheets
2" pipe cleaners 22 of each color (bent into a "z" shape)- Red, green, white, orange, black, brown, yellow, blue, purple
An item to mark the student's "nest" area (coat, mat, or piece of paper)

Apsáalooke is the true name of the Crow tribe is Apsáalooke, which means Children of the Large Beaked Bird (refer to the first paragraph of http://lib.lbhc.cc.mt.us/history/1.00.php for more specific information). Students will learn the name of birds in Apsáalooke and their meanings (use the "Bird Cards," http://lib.lbhc.cc.mt.us/history/lessonplans/bird_cards.pdf, found in the "Bird Cards" Lesson, http://lib.lbhc.cc.mt.us/history/lessonplans/bird_cards.php. Students will discuss the definitions of the words and understand these definitions are based on the observations of the bird's physical characteristics.

Students will then be divided into groups, representing one of these predatory birds. Each group will discuss the type of bird they are representing and what would be their prey in their natural setting. The students will research what is the diet of each of these birds. All students will come back together into one large group and share their results of the birds' diets. Next students will choose eight of the prey creatures they researched and match them to a pipe cleaner color. The pipe cleaners represent the different prey these types of birds would be eating. Examples are insects, small reptiles, amphibians, and rodents. Example, red= beetles

Science Grade 3 Animal Adaptations (continued)

Before the pipe cleaners are scattered on the ground, the class will predict which color of pipe cleaner will be retrieved the most and which color will be retrieved the least. One student records the class predictions.

Students will then form a large circle in an outside grassy area. Each "bird" will set up his/her nest in his/her spot in the circle. Prior to setting up the nest, the teacher will spread the pipe cleaners on the ground in the center area of the large circle used for this activity. The size of the circle depends on the size of the class. Have students at least an arm's length away from each other.

The task of each bird group: pick up as much "food" as they can in a ten second round.
The teacher will call a start time and the students will have ten seconds to search for their prey, picking up just one pipe cleaner at a time and returning it to the nest before another pipe cleaner can be retrieved. The class will run five trials. At the end of each trial the students return to their nests and tally the different colors of pipe cleaners they retrieved. After the fifth trial the area is cleaned and the class moves inside to calculate their results.

Students will take their tally charts and convert them into a bar graph format. Next students evaluate their graphs and discuss which pipe cleaner color was retrieved the least to the most. Once students have created their graphs, engage students in a discussion to address the following questions.

- Which color was the hardest to find?
- Why did that "creature pipe cleaner" have the best camouflage?
- Was the least retrieved color what the group predicted would be the hardest to find?
- Make a master class list of the "find food" results. Are the results of the master list different from the results of the individual graphs?
- Were all of the pipe cleaners retrieved?

Allow time to review the concepts of this lesson as follows: Students will complete this activity by writing a paragraph about the bird they represented, explaining what their graph results reflected about the colors of camouflage, and how this relates to the real world around them.

Students will divide back into their bird groups and give a report to the classroom on "what I learned today."

Resources
Stories

Real Bird, H. (1977). *Birds and People*- **Book 11-** A Crow Story: Portland, OR: Pacific Northwest Indian Reading and Language Development Program, Northwest Regional Educational Laboratory; Beaverton, OR: Educational Systems, Inc.- http://www.nwrel.org/indianed/indianreading/1/book11.pdf

Caduto, M. & Bruchac, J. (1991). "How the Fawn Got its Spots". *Keeper of the Animals.* Golden, CO: Fulcrum Publishing.

Thomason, Dovie (Lakota/Kiowa-Apache), "The Animals' Wishes." 2000, color illustrations; Iroquois.

Otto, Simon (Ojibwe/Odawa), *Walk in Peace: Legends and Stories of the Michigan Indians*. 1990, b/w illustrations.

Apsáalooke Bird names:
McCleary, Carrie. Little Big Horn College. *Apsáalooke Writing Tribal Histories Project*.

Real Bird, H. (1977). *Birds and People*- ***Book 11-*** A Crow Story: Portland, OR: Pacific Northwest Indian Reading and Language Development Program, Northwest Regional Educational Laboratory; Beaverton, OR: Educational Systems, Inc.- http://www.nwrel.org/indianed/indianreading/1/book11.pdf

Medicine Horse, Mary Helen. 1987. *A Dictionary of Everyday Crow*. Crow Agency, Montana: Bilingual Materials Development Center.

"Find Food" Lab Make a tally mark for each pipe cleaner collected in each trial.					
	***Trial 1***	***Trial 2***	***Trial 3***	***Trial 4***	***Trial 5***
red					
green					
white					
orange					
black					
brown					
yellow					
blue					
purple					

Adaptations: Offensive and Defensive

Place your sticky note under “Offensive” if the adaptation is offensive and under “Defensive” if it is defensive.

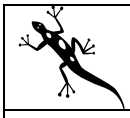
Bar graphs for each trial run.

Food Find Trial 1

Pipe cleaners Retrieved										
	22									
	20									
	18									
	16									
	14									
	12									
	10									
	8									
	6									
	4									
	2									
		red	green	white	orange	black	brown	yellow	blue	purple

Food Find Trial 2

Pipe cleaners Retrieved										
	22									
	20									
	18									
	16									
	14									
	12									
	10									
	8									
	6									
	4									
	2									
		red	green	white	orange	black	brown	yellow	blue	purple



Food Find Trial 3

Pipe cleaners Retrieved									
22									
20									
18									
16									
14									
12									
10									
8									
6									
4									
2									
red		green	white	orange	black	brown	yellow	blue	purple

Food Find Trial 4

Pipe cleaners Retrieved									
22									
20									
18									
16									
14									
12									
10									
8									
6									
4									
2									
Red		green	white	orange	black	brown	yellow	blue	purple

	***Food Find Trial 5***									
Pipe cleaners Retrieved	**22**									
	20									
	18									
	16									
	14									
	12									
	10									
	8									
	6									
	4									
	2									
		red	green	white	orange	black	brown	yellow	blue	purple

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Science Model Teaching Unit
Montana Skies

Created by Roni Hawkins

Grade 3

Stage 1 Desired Results

Established Goals

Science Content Standard 4: Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.
Benchmark 4.6: Identify objects (e.g., moon, stars, and meteors) in the sky and their patterns of movement and explain that light and heat comes from a star called the sun.

Essential Understanding 1: There is great diversity among the 12 tribal nations of Montana in their languages, cultures, histories and governments. Each Nation has a distinct and unique cultural heritage that contributes to modern Montana.

Essential Understanding 3: The ideologies of Native traditional beliefs and spirituality persist into modern day life as tribal cultures, traditions, and languages are still practiced by many American Indian people and are incorporated into how tribes govern and manage their affairs.

Additionally, each tribe has its own oral histories, which are as valid as written histories. These histories pre-date the "discovery" of North America.

Essential Understanding 6: History is a story most often related through the subjective experience of the teller. With the inclusion of more and varied voices, histories are being rediscovered and revised. History told from an Indian perspective frequently conflicts with the stories mainstream historians tell.

Understandings	Essential Questions
Students will… • understand and identify the moon, sun, and stars. • become familiar with three or four well known constellations. • discover that Montana tribal nations have different stories that explain the origin of the sun, moon, and stars, as well as their own star stories that go with each constellation or star.	• How can you identify the moon, sun, and stars? • What is a constellation and how can you identify each constellation? • What are some of the star stories that different Montana tribal nations have about the objects in the sky?

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Science Grade 3 Montana Skies (continued)

Students will be able to…	*Students will know…*
• name the main objects in the sky: moon, sun, and stars. • name and identify three or four constellations. • tell or at least recognize different star stories about the constellations of various Montana tribal nations. • Construct a model of a constellation.	• there are objects in the sky such as the moon, sun, and stars. • a constellation is a group of stars visible from Earth that forms a distinctive pattern and name. • each tribal nation has their own stories that explain the sun, moon, stars, and constellations.

Stage 2 Assessment Evidence

Performance Tasks

Each student will complete a KWL chart to assess their prior knowledge of the subject matter. Students will complete the chart to tell (K) what they already know about the sun, moon, and stars, (W) what they would like to know about the subject matter, and (L) what they learned upon completion of the lesson and activities. Students will also draw sketches of the constellations they learn while hearing and reading the traditional stories that Montana tribal nations have for each constellation.

Other Evidence

Students will keep a journal of what they have learned during the lesson. Students will also create a poster or brochure highlighting facts about the sun and its relationship to the Earth.

Stage 3 Learning Plan

Explain to students they are going to be learning about the objects in the sky as well as some of the stories that different tribal nations have about these objects.

To assess the students' knowledge, students will complete the KWL chart. In the first column, K, have students record anything they know about the objects in the sky, whatever knowledge they have about the sun, moon, and stars. In the next column, L, students will write what they hope to learn about this subject during the course of the lesson. After students have completed these two columns, have students share their responses with the class. As students share their "L" column, record their answers so they can be addressed during the course of the lesson.

After assessing the students' knowledge, begin talking about the objects in the sky. Introduce the three objects that will be studied, the moon, sun, and stars. Ask for volunteers to give their own definition of what they think each object is. Allow different students to respond to encourage different ideas and definitions to be shared. After collecting different responses, have students look up the definitions of each item either in their science book or their student dictionary. Have students share what they read. How does this vary from the definitions they gave in their own words? In their journals, have students record each definition.

After discussing each object, discuss the time of day each object can be seen in the sky. Show students their local newspaper and where to find the times for sunrise and sunset (if needed, local newspapers can often be accessed online). Over the next couple of weeks, students need to check their local paper to find the times for sunrise and sunset. These will need to be recorded in their journals daily.

Before students learn about different tribal stories of a few constellations, they will need to learn about the sun and its relationship to the Earth. In small cooperative groups, have students discuss what they know about the sun. They may compare their KWL charts that they just completed. After students have had time to discuss, have each group report to the whole class on what was discussed.

Next students will make a poster or a brochure that tells about the sun. The poster should include various facts including the following:

- Distance of the sun from Earth
- Size of the sun
- Temperatures of the sun
- Other interesting facts

The poster should also contain pictures of the sun. The following Web sites are excellent resources for students to use in their research:
http://solar-center.stanford.edu/compare/ - Note: The "Solar Folklore" section contains both tribally specific and non-tribally specific stories.
http://www.nsf.gov/news/classroom/astronomy.jsp - Note: The National Science Foundation provides these links for teacher and student use.

Students may also use their science books or other resource materials they may find in their library. Encourage students to explore the "for students" section on the Web site http://solar-center.stanford.edu/ as it has numerous valuable and interactive activities.

After discussing the moon and the sun and sharing student posters, explain to the students they are going to learn about different stars and groups of stars called constellations. Ask students if they are familiar with what a constellation is and if they can name different ones. Share with students some of the better known constellations. You can show them pictures of these. Some good examples are the Big and Little Dipper, Cassiopeia, Orion, or any others with which they may be familiar.

Next, explain to students the main focus of their constellation study is going to be on the stories that many tribal nations have about not only the sun and moon, but also the constellations. Many of the constellations are named after or have stories originating from Greek mythology but Native people also have their own stories that go with these objects. The students will be listening to and reading a number of tribal stories about stars.

The first story they will hear is an Assiniboine story called "How the Morning and Evening Stars Came to Be." This story can be found online at www.nwrel.org/indianed/indianreading/, located in the section labeled Level III, Book 7. This story is also in the book titled *How the Morning and Evening Stars Came to Be and Other*

Assiniboine Indian Stories. This book was provided to all Montana school libraries from the Office of Public Instruction.

Next, students will have the opportunity to listen to the Blackfeet story about Pleiades and the Six Lost Boys. Show students some pictures of Pleiades so they have a picture in their mind while they are listening to the story told by Clifford Crane Bear. You can find the story online at this Web site: http://www.virtualmuseum.ca/Exhibitions/Cosmos/english/html/skystories.html

Note: You will need to scroll down toward the bottom of the page until you reach the Blackfeet star stories (there are stories from other tribes on this Web site as well). Click on the link to listen to the story of Pleiades. The transcript of the story is also available to print out and read to the students if you are unable to listen to the story.

While students are listening to the story, have them sketch the story in their journals. This is a time where students really have the opportunity to record whatever images they see as they listen to the story. After the story, have students share their sketches with the class.

The final story students will hear is about the Big Dipper. Students will listen to the Assiniboine story of how the Big Dipper and North Star came to be. Again, prior to reading the story, show students pictures of the Big Dipper. Arrange students in cooperative learning groups. Give each group a picture of the Big Dipper. Have the groups count how many stars are in this constellation and then have each group member draw a quick sketch of the constellation. One advantage of the cooperative groups is if any students are having trouble making a sketch of the constellation, they can have a group member help them with their sketch. Quickly check each student's sketch for accuracy as they will be using this as a pattern to build a model of the constellation.

Now that students are familiar with what the Big Dipper looks like, they will listen to the Assiniboine story, "How the Big Dipper and North Star Came to Be," as told by Jerome Fourstar. This story is found in the book H*ow the Summer Season Came and other Assiniboine Indian Stories*. This book was provided to Montana school libraries from the Office of Public Instruction. (The story, which is a Level 5 Book 14, can also be downloaded from the following Web site: http://www.nwrel.org/indianed/indianreading/5/index.html.) Explain to students that while they are listening to the story they are going to build a model of the Big Dipper. Students will use marshmallows and toothpicks to build the model. While students are listening, they should use their sketch as a pattern to follow to build their model. Be sure to explain to students this is a time to listen and work. This is an independent project and if they are visiting with classmates, they will not be able to hear the story.

After reading the story to the students, allow time for students to share their models if they wish. The models are also a great project to display from the ceiling or on bookshelves.

Extension Activity

As an extension activity, you can show students various constellations. Have students write their own stories about the constellations and how they came to be.

Another activity that students always enjoy is to give them a star chart and have them go outside at night to look for different constellations. Copies of star maps can be found at http://www.skymaps.com/downloads.html. You can download the star map for the current month.

Materials Needed

- Notebooks for journaling
- Index cards (for sketching Big Dipper pattern)
- Marshmallows (either miniature or regular size)
- Toothpicks or kabob sticks (depends on the size of marshmallows used)

Resources

Books

- *How the Morning and Evening Stars Came to be and Other Assiniboine Indian Stories*. Helena, MT: Montana Historical Society Press, 2003.

- H*ow the Summer Season Came and Other Assiniboine Indian Stories*. Helena, MT: Montana Historical Society Press, 2003.

Web sites:

- http://www.virtualmuseum.ca/Exhibitions/Cosmos/english/html/skystories.html
- www.nwrel.org/indianed/indianreading/
- http://www.skymaps.com/downloads.html
- http://solar-center.stanford.edu/compare/
- http://www.nsf.gov/news/classroom/astronomy.jsp
- http://solar-center.stanford.edu/

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Science Model Teaching Unit Bitterroot Adaptations and Salish Traditions

Created by Carol Bruderer

Grade 4

Stage 1 Desired Results

Established Goals

Science Content Standard 3: Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment**.**
Benchmark 4.l: Identify plants … have structures, and systems that serve different functions for growth, survival, and reproduction.
Benchmark 4.3: Describe and use models that trace the life cycles of different plants and discuss how they differ from species to species.

Essential Understanding 1: There is great diversity among the 12 tribal Nations of Montana in their languages, cultures, histories and governments. Each Nation has a distinct and unique cultural heritage that contributes to modern Montana.

Understandings:
Students will understand…
- how careful observation can be used as a vital scientific tool to study plant adaptation.
- the Bitterroot's unique adaptations for survival.
- the Salish People's comprehensive knowledge of the Bitterroot.
- why the Salish revered the Bitterroot and its properties.
- the importance of respect for Salish knowledge of native plants.
- plants are essential to our human survival.

Essential Questions:
- How do some Salish people study plants?
- How do some scientists study plants?
- How would you find out more about the Bitterroot?
- How do plants adapt to the environment they live in?
- How does understanding plants help you today?
- Why do you think Indians honored certain plants?
- How does knowledge about plants affect your life in your community?

Students will be able to…
- explain (written or orally) why recorded observation is a legitimate tool of scientific inquiry.
- create a chart, with a partner, listing bitterroot plant parts, plant needs, adaptation indicated, evidence for adaptation *see sample teacher chart.

Students will know…
- observation is a legitimate tool of scientific inquiry.
- an adaptation is a process that helps a plant meet its needs in its environment.
- how to make logical deductions based on anecdotal evidence and understanding of plants.

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- create and present an artistic product symbolizing a respectful understanding of Salish Bitterroot tradition.
- write a letter explaining their opinions concerning the survival of the Bitterroot.

Stage 2 Assessment Evidence

Performance Tasks

- Keep a recorded journal of important information about Bitterroot plants.
- Create a chart, with a partner, listing bitterroot plant parts, plant needs, adaptations, why you think this is an adaptation, know (evidence) *see sample teacher chart.
- Create and present an artistic product symbolizing your feelings and understandings about the Bitterroot.
- Write a letter to the Governor expressing your opinions concerning the survival of the Bitterroot.

BITTERROOT PLANT UNIT EVALUATION Name_____

	0-7 pts	8-16 pts	17-25 pts
Individual Journal 25 pts	Difficult to read Most of the information is confusing Uses 1 source	Readable Some of the information is confusing Uses 2 sources	Neat Accurate Information Uses 3 sources
Adaptation Chart with Partner 25 pts	Difficult to read Headings Records confusing Adaptations are not logical	Readable 4 headings 8-16 entries 2-3 adaptations listed with logical support	Neat 4 headings 18-24 entries 4-6 adaptations listed with logical support
Artistic Product 25 pts	Quick, sloppy Exhibits minor know-ledge of the Bitterroot	Average effort in construction Not unusual Exhibits minimal know-ledge of the Bitterroot	Carefully constructed Unique and creative Exhibits knowledge of the Bitterroot
Letter To Governor 25 pts **<u>Student's Score</u>** **Individual Journal __** **Adaptation Chart __** **Artistic Product __** **Letter to Governor __** **Total (100 pts) __**	Spelling or handwriting make it difficult to read No opinions listed No support included	Readable Lists 1 opinion about Bitterroot survival Minimal support included	Neat Lists 1 opinion about Bitterroot survival Excellent support for opinion reasoning

Student Self Evaluation **Name**_____

1. What parts of the assignment did you do well?

2. What parts were hard for you?

3. What did you do to help yourself when things were hard or you didn't understand?

4. What are at least two things you learned from this unit?

Stage 3 Learning Plan

Prior Knowledge: Basic plant structure and function are concepts that are needed prior to engaging students successfully in this lesson.

Day 1

1. Teacher passes out a copy of the following scenario; read together as a class:
   "*You are a botanist (a plant scientist.) Your task for this unit is to solve the mystery of the Bitterroot. The Governor and Salish Indian Leaders are concerned we may be in danger of losing our state flower, the Bitterroot. You are working with the Fish, Wildlife and Parks Department as well as the Confederated Salish and Kootenai Tribes (CSKT) to find out everything you can about the Bitterroot plant, its adaptations to its environment, why it is important to the Salish, and if it is endangered. Send your findings in a letter to the Governor. Be sure to include your opinion and support for whether the Bitterroot is in jeopardy of becoming extinct."*
2. Teacher leads discussion of key terms in understanding all plants:
   - What do we know about plants?
   - What are the three main parts of a plant? Leaves, stem, roots
   - What four things do plants need to live? air, water, nutrients, sunlight
3. Scenario discussion
   - What plant are you to study? Bitterroot
   - What are adaptations? Can you find it in the glossary of the science book? An adaptation is a body part or behavior that helps an organism meet its needs in its environment. For our purposes, it is a part of a plant (or process) that helps it meet its needs in its environment.
4. Discuss examples of adaptations. (If you are using Harcourt Science, use p. A74-75 & p. A80-81, Otherwise consult your science text.)
5. For a quick visual assessment, ask the students to write on a piece of paper at least one part of a cactus that shows adaptation (shallow roots, fleshy leaves full of water, etc.).

Day 2 (45 min lesson)

1. Students make a journal out of 4-6 half sheets of lined paper and two half sheets of construction paper for a front and back cover. Distribute the journal entries written by a Helena teacher about Bitterroot found

around her home. (See attachment A) With the class, read through one entry and model entering important information in student journal. Give students 15-25 minutes to complete this task.

2. Students share with the class some of the information they wrote down, give other students the chance to revise if necessary.

Day 3 (45 min lesson)

1. Watch the DVD The Story of the Bitterroot, Section 3, "Botany"
   Focus: Have students list new facts they learned about bitterroot in their journal. Teacher may periodically stop DVD for students to take notes. When DVD is finished, teacher will summarize the facts identified by the student comments on the board. Students revise their journals as needed.

2. In a teacher led discussion, students brainstorm ideas to format the info they have journaled. (Example of chart follows)

Bitterroot Plant Parts and their Adaptations

Plant Parts	Plant Needs	Adaptation to the Environment	How Do You Know?
Roots	water nutrients	tap root to maintain energy in dry environment	plant will grow again with only a piece of root
Leaves	water	narrow, slender, needle-like minimizes evaporation	test leaves that peak out in spring
	sun, air	photosynthesis is occurring	leaves are green, only appear in spring
Flowers	reproduction	seeds in center in hard, thick shells	shells protect tender seeds

3. Using the information in their journals, the students prepare a completed chart with a partner, using the format established by the class discussion. Upon completion, share the work with another partner group. Each group should add any additional information they discover from the partner group they consult. You may have students compare with 1-3 other partner groups.

Day 4 (45 min lesson)

1. Watch DVD, The Story of the Bitterroot
   Focus: Salish Bitterroot origin story and the part the plant plays in their traditions. For a list of discussion questions, see the teacher's guide that accompanies the DVD.
   Section 1, "The Legend of the Bitterroot"
   Section 5, "When We Were Children"
   Section 6, "Mr. Bitterroot"
   Section 7, "The Gathering"
   Section 8, "The Future"

2. Students will create and present an artistic product symbolizing a respectful understanding of Salish Bitterroot traditions (example: poem, painting, sculpture, collage).

Day 5 (45 min lesson)
Students will utilize writing skills by drafting a letter to the Governor of Montana about the Bitterroot and its future. They should include: reasons it's important to preserve the Bitterroot for Montanans, specifically including the Salish Indians, what the Bitterroot needs to survive, his/her opinion about the possible extinction of the Bitterroot with support for his/her reasoning.

MATERIALS AND RESOURCES NEEDED
The Story of the Bitterroot, DVD Historical Documentary distributed by OPI. Exceptionally researched, uses Native peoples' descriptions of their experiences, current-day botany evidence, how it became our state flower, how two cultures (whites/Indians) are coming together to keep the Bitterroot from disappearing. A copy should be in every school library. It has a lesson plan for 8th grade that accompanies it, but the DVD and Lesson Plan is age appropriate for 4th grade students. It is divided into sections that can be viewed separately at different times:
Legend of the Bitterroot
"Corps of Discovery"
Botany
The State Flower
When We Were Children
Mr. Bitterroot
The Gathering
The Future

Science Textbook unit on life sciences, plants section for basic needs, plant parts, and vocabulary [Ex: "Harcourt Science," Unit B, pp. A68-A87, (Attachment)]

Attachment A: OBSERVATIONS of a Helena Teacher about Bitterroots Growing by her Home

June, 2002 We are starting to build our new house on Lincoln Road. I'm there helping when I realize there are beautiful pink flowers blooming close to the ground. The day is hot, about 90 degrees and it's very dry. The soil is sandy and I recognize sage brush and some clumps of wild grass. I go get my plant field guide to wildflowers and I'm almost sure the pink flower is the Bitterroot. They are such a beautiful contrast to the dirt and dull color of the sage brush. That evening the flowers fold up into almost a bud shape. They bloom for only about a week and then all signs of them are gone.

June, 2003 Today I was walking to the edge of our lawn where the fields were still wild and I started watching for any sign of the bitterroots I had seen last year. After a few days I noticed some little clumps of "plump" needle-like leaves that came out from a central point like petals. They suddenly appeared where there had been no sign of them. I watched for about a week and the leaves die and in their place are pink cone-shaped buds. They bloom again for about a week and then everything disappears.

June, 2004 I am anxiously looking to see if the bitterroots appear again. They are such pleasant splashes of

color in the dry field. I keep watch and in about 2 weeks, the plump needlelike leaves appear from nowhere. It's a good thing they are all over the hillside because I can never remember exactly where to look. This year, however, I'm doing my Montana History unit right now and I want to show the kids a bitterroot. So I dig up a clump of leaves and plant it in a pot I have, keeping it outside until it blooms. Sadly, the leaves disappeared, no blooms appeared, and the plant dies.

June, 2005 I am approaching the bitterroot season sadly this year because I want so badly to show my students, but I couldn't get the plant to live. I still watch and in a week or two the plump needle-like leaves appear. Then they die and the buds appear. They blossom and in a week everything is over. So I take a picture of one of them to show my students.

In late June I decided to transplant some plants and I went to a pile of pots, grabbing the top one. Strangely, the pot underneath has dirt and a plant growing in it. I assume it's a weed and wonder how it could grow under another pot with no sun getting to it and no water except the snow from winter. Somehow it doesn't look like any weed I've ever seen. I leave it by the shed and continue my transplanting. A few days later I realize that pot was the one I had the bitterroot in. The plant had come back to life after a year of neglect. I planted it in my garden and it bloomed that year although it bloomed in late June instead of early June like the rest.

June, 2006 This yearly Spring watch for the bitterroot is becoming a pleasant anticipation. I'm excitedly watching the field. A few days later, the clump of green leaves appear—a few at first, then many. Still no flower buds have appeared. A week later, the buds are up and some are blooming. I head outside to take some pictures. They are so close to the ground, the sage brush almost hides them. At least I now have pictures to show my students.
About a week later, the blooms are dried up and blown away. No sign that the plants were ever there.

May, 2007 The bitterroot came early to the field this year—we did have a wetter spring. First the clump of leaves appear, then they disappear, the buds come and bloom.
Science Grade 4 Bitterroot Adaptations and Salish Traditions (continued)

July, 2007 The bitterroot in my garden still has leaves but it hasn't bloomed. By the end of July, the leaves have disappeared and buds are blooming. This is the latest I've ever seen this one bloom.

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Science Model Teaching Unit
What's in the Ecosystem in Your Neighborhood

Created by Carol Bruderer

Grade 4 - Approximate Duration: 6 hours

Stage 1 Desired Results

Established Goals

Science Content Standard 1: Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.
Benchmark 4.6: Identify how observations of nature form an essential base of knowledge among the Montana American Indians.

Science Content Standard 3: Students, through the inquiry process, demonstrate knowledge of the characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.
Benchmark 4.4: Explain cause and effect relationships between nonliving and living components within ecosystems; and explain individual response to the changes in the environment including identify differences between inherited, instinctual, and learned behaviors.

Essential Understanding 1: There is great diversity among the 12 tribal Nations of Montana in their languages, cultures, histories and governments. Each Nation has a distinct and unique cultural heritage that contributes to modern Montana.

Understandings	Essential Questions
• An ecosystem is made up of groups of living things and the environment they live in. • The living and nonliving parts of the ecosystem interact with one another. • Nature observations used by Montana Indians form an essential base of knowledge.	• What is an ecosystem? • How would you describe the importance of each major part of an ecosystem? • How do some Montana Indians learn about the environment?

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Science Grade 4 What's in the Ecosystem in Your Neighborhood (continued)

Students will be able to…	*Students will know…*
• explain why written or oral observations are an important tool of scientific inquiry. • draw or describe an ecosystem classifying and labeling the living and nonliving parts. • identify five plants and two insects in a neighborhood field ecosystem. • compare and contrast their drawing with others in the classroom to see where they are similar and/or different.	• an ecosystem is made up of groups of living things and the environment they live in. • the living and nonliving parts of the ecosystem interact and are dependent on one another. • how to identify eight Montana native plants. • nature observations used by some Montana Indians form an essential base understanding about plants, animals, and human relationships. • it is important to respect living things in our environment.

Stage 2 Assessment Evidence

Performance Tasks

- Create a drawing, with a partner, of a neighborhood ecosystem, identifying and labeling five plants, two insects and six non-living things. This task should be done through observation and study, rather than causing harm to the species being studied. Western scientific beliefs about living and non-living "things" are in contrast to some Native perspectives. "Nonliving" is a scientific term that labels items around the idea that items such as rocks, dirt, etc. are not alive.
- Identify and describe five interactions between things in the ecosystem.
- Shows respect for living things during the field observation by not picking plants for the purpose of careful observation and drawing.

ECOSYSTEM EVALUATION

Name _____

ECOSYSTEM DRAWING	0-20 points	21-40 points	41-60 points
Student Identifies and labels	1-2 different plants 0 insects 0-3 "nonliving" things	3-4 different plants 1 insect 4-5 "nonliving" things	5 different plants 2 insects 6 "nonliving" things
Effort shown in drawings	Sloppy, little effort Argues with partner, Unproductive	Readable, average effort Cooperative most of time Product missing minor parts	Neat and accurate Cooperative Complete product
ECOSYSTEM INTERACTIONS	0-7 pts	8-16 pts	17-25 pts
Drawn or written description	0-1 example 0-2 Little understanding	2-3 examples Average understanding	4-5 examples Excellent understanding
RESPECTS NATIVE AMERICAN UNDERSTANDINGS ABOUT LIVING THINGS	0-7 pts	8-16 pts	17-25 pts
The Student	Picks plants Little care in plant observing or drawing	Obeys rule but shows no other signs of understanding	Does not pick plants Is careful when observing Invests time in plant drawings
Combined Student Score Ecosystem Drawing Ecosystem Interaction Respect for Traditional Native American Understandings About Living Things Total	50 pts _____ 25 pts _____ 25 pts _____ 100 pts _____		

Student Self Evaluation

1. What parts of the assignment did you do well?

***2.* What parts were hard for you?**

***3.* What did you do to help yourself when things were hard or you didn't understand?**

***4.* What are at least two things you learned from this unit?**

Stage 3 Learning Plan

Learning Activities

Day 1

1. Begin with students turning to the chapter on Ecosystems in their science textbook. Use the text as the focus for a discussion of ECOSYSTEM and its meaning: Groups of living and nonliving things and the environment in which they live.

2. Ask questions such as:
   - *What are some living things?* Plants and animals
   - *What are some nonliving things that affect living things?* Sunlight, soil, air, water, temperature
   - *Why do you think it is important to study ecosystems?* Accept any reasonable answer

3. Explain to students that asking questions about something is one way we learn.
4. For this lesson, we are going to use two ways of studying nature. Hundreds of years ago, Montana Indians were experts in understanding ecosystems. Montana Indians knew which plants they could eat, which ones could heal sickness, and how to use plants respectfully so they would continue to grow and be available. Montana Indian understanding of plants and animals helped them survive for thousands of years.
   One way Indian people learn about their environment is through observation or looking carefully at their surroundings. Joseph Bruchac says, "Today, few people make full use of their senses. Our Creator gave us each two ears and two eyes and only one mouth. That should remind us that listening and observing are twice as important as talking." (Bruchac, J., *Native American Games and Stories.* Fulcrum Publishing. 2000.)

Optional:

5. Read *Muskrat Will Be Swimming*, by Savageau.

6. After the story, ask these questions:
   - How did the girl in the story use her observation skills?
   - How was this important to her understanding of the lake and the animals that lived in the lake?

Day 2

As a class, students will engage in a game played by some American Indian people. This game is called 'The Rock Game" and can be found in *Native American Games and Stories,* by Joseph Bruchac. It is a game that will help students to practice using their senses.

Teacher Preparation: Divide class into small groups of 6-8 students. Prepare bowls of rocks, one rock for each student in that group. Find distinctive rocks, different from one another.
Note: teacher may want to label each rock with a symbol on masking tape. Just be sure that side is down when the students look for their rock. Prepare blindfolds for each student.
Blindfolds can be made by ripping strips from scrap cloth.

Play: Each small group sits in a circle on the floor and the teacher places one of the rock bowls in the center. Each student picks a rock from a bowl and is given 2-5 minutes to memorize it--look, feel, touch, smell (Remind students not to taste – as that is not an acceptable observation in science). They then put the rock back in the bowl and the teacher shakes the bowl pouring the rocks on the floor. The students have to use only their eyes and find their rock. When everyone has their rock, they must return the rock to the bowl and put on a blindfold. Then the teacher dumps the rocks out on the floor and each person must carefully crawl and find their rock without looking. When the game is finished, discuss why this game would help you observing ecosystems.

Day 3

1. Read the entire book *Between Earth & Sky, Legends of Native American Sacred Places*, by Joseph Bruchac and Thomas Locker.
2. Engage the class with a discussion of what they thought was important about this story.
   - What did Little Turtle learn from his uncle Old Bear? There are sacred places all around us respect for each other, for all living things
   - Is this something important for 4th graders? For grown-ups? Yes, for all people.
3. Show examples of plants they may find, help them make their own resource sheet to help them in the field study. Example: Foxtail grass has a soft "fox tail" on the top.
4. Explain students will be going on a "walking fieldtrip" and that they will work with respect for all living things by not to pick any plants on this field trip.
5. Hand out the clipboards and paper, have them get their pencils, assign partners and take them to the natural area where they will observe and record what they see. Assign spots and give the students 15-30 minutes to explore, observe, and record, making sure they date their information in the top right-hand corner of their paper. Students save their drawings for tomorrow's compiling of info and ecosystem drawing.

Day 4
Ecosystem Walk
Teacher Preparation

- Choose a natural field site to observe that is in close proximity to the classroom: Before taking the students out, the teacher should preview the area. Identify the plants, using a plant identification guide. One resource: *Rocky Mountain Wildflowers* by Craighead, Craighead, and Davis.
- Availability of plant species will impact the expectations established for the students in the evaluation.
- Prepare a paper grid and approximately section off the natural area site into 3'x 3' squares for student pairs to use for their identification and observation. You can do it mentally with landmarks in mind or stake out with stakes and string. Plan and record what partners will work together in which area. This grid will help the teacher place the finished drawing together to create a large ecosystem on a classroom bulletin board.
- Plan to talk to students about the respect some Native people have for living things. Many Native Americans hold the understanding that plants and animals are relatives and should treated with respect. What we do to the earth affects us and many other beings. Ask the students if picking plants that won't be used for food or medicine is showing respect for the ecosystem. Students will want to pick up things but emphasize this is a "watching and recording walk." For most plants, they will observe carefully with their eyes. Be aware of noxious weeds and never take flowers or seeds from them.
  Reference: Caduto and Bruchac provide an excellent summary of classifying and identifying plants in a traditional Native American approach on p. 20-24 of their book, *Keepers of Life, Discovering Plants Through Native American Stories and Earth Activities for Children.*
- Use guidebooks to identify plants or teacher can take digital photos to identify back in the classroom.
- This is a great opportunity to invite knowledgeable tribal experts to go with you and your class into the field for plant identification. You may begin by contacting the tribal college closest to your area: http://www.opi.mt.gov/indianed2/IEFALinks.html.
- Have several pieces of letter-size white copy paper on a clipboard for each student. Students will use this for drawing plants and writing notes.
- Make copies of the Ecosystem Evaluation sheet above and give it to each child to put on their clipboard. Explain this is how they will be assessed.

Day 5
Ecosystem Cooperative Drawing

1. In this day's lesson the students take their observation knowledge and create an ecosystem drawing with their partner on an 11"x14" sheet of paper. The partners will share notes and pictures of what they observed that was in their plot of the natural site.
2. Assign students to identify and label five plants, two insects, six nonliving things (this is keyed to the evaluation and is dependent upon what is available in the site you choose). Remind students that not all cultures consider things like rocks or water "nonliving."
3. An additional part of the assignment is to identify key nonliving parts: sunlight, soil, air, water, and temperature. Example: there is a lot of sun or mostly shade, soil is sandy or compacted, any signs of rain such as soil damp. Thermometers could be taken out to record the temperature that day.
   Remind students that because their observations were for yesterday, they must date their ecosystems creation with the same date.

Ask, "How could you find out what it's like in winter in your ecosystem?" (Observe the area at least once a season.) Give the student teams about 30 minutes to finish their ecosystem drawings.

4. Teacher will take the student drawings and place them on a bulletin board to create a full picture of the ecosystem at the site from the previously drawn teacher matrix. Students compare and contrast what they see.
   Possible questions:
   What do you notice about the drawings? How are they different? How are they similar?
   What plants are in all sections? Are there any plants that are only in one or two sections? Are these sections close to one another? What does this tell us about seeds or reproduction? Are the insects the same? If different, why do you think they are? Are the soils and rocks the same? Are the "nonliving" things the same?

5. Yesterday we talked about "getting to know" some of our Montana plants. Is there anything you've learned about one of the plants since yesterday? Accept and note reasonable comments on the board.

Day 6
Ecosystem Interactions

1. Return to the natural area and discuss interactions between living and nonliving things in the area. Example: Point to a plant and pick up some soil. How does the soil help the plant? Gives it nutrients. Can any plant grow in this soil? No, there may be not enough or the right kind of nutrients.

2. Students should observe their 3'x 3' plot again and with their partner, write down at least five interactions between living and/or nonliving things. Give students 15-20 minutes to do this. Return to the classroom and using the bulletin board ecosystem, have each student come up and explain one interaction. After they are finished, the teacher collects and evaluates each page of interactions, recording the student's points on their evaluation sheet. Points are totaled and comments written on the evaluation sheet.

Resources

Bruchac, James and Joseph Bruchac, *Native American Games and Stories*. Golden: Fulcrum Press, 2000.

Bruchac, James and Thomas Locker, *Betweeen Earth & Sky*. New York: Harcourt, Inc., 1996.

Caduto, M., and Bruchac, James., *Keepers of Life, Discovering Plants Through Native American Stories and Earth Activities for Children.* Golden: Fulcum Press, 1998.

Craighead, John, Craighead, Frank and Ray Davis, *Rocky Mountain Wildflowers, Peterson Field Guides.* Boston: Houghton Mifflin Co., 1963.

Savageau, Cheryl (Abenaki), *Muskrat Will Be Swimming.* 1996, color illustrations; Seneca.

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Science Model Teaching Unit
Tall Tales (Mechanical Weathering, Glacier Features, and Indigenous Mountain Names)

Grade 5 - Approximate Duration: 150 minutes

Stage 1 Desired Results

Established Goals

Science Content Standard 2—Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.

Science Content Standard 4—Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.

Science Content Standard 5—Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.

Essential Understanding 3: The ideologies of Native traditional beliefs and spirituality persist into modern day life as tribal cultures, and languages are still practiced by many American Indian people and are incorporated into how tribes govern and manage their affairs.

Additionally, each tribe has its own histories, which are as valid as written histories. These histories predate the "discovery" of North America.

Essential Understanding 6: History is a story most often related through the subjective experience of the teller. With the inclusion of more and varied voices, histories are being discovered and revised. History told from an Indian perspective frequently conflicts with the stories mainstream historians tell.

Understandings	Essential Questions
• **Mountain Indigenous Name:** pertaining to the feature of geological shape or glacial feature. • **Mechanical Weathering:** ice wedges, release pressure, chemical weathering, abrasions from wind, plant action. • **Glacial Feature**: Cirques (blue color code), u-shaped valley (green color code), snowfield (red color code), cirque glacier (orange color coded).	• On the east side of Glacier National Park, what mountains retain American Indian names? • What are the different types of mechanical weathering process? • What are the different types of glacial features? • How are those features different?

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Science Grade 5 Tall Tales (Mechanical Weathering, Glacier Features, and Indigenous Mountain Names) (continued)

Students will be able to…	*Students will know…*
• name at least two peaks in Glacier National Park. • understand the meaning of the Native name of the peaks in Glacier Park • create a model of a mountain with glacial feature. • demonstrate knowledge of erosion and past /present ice age remnants pertaining to geological features by response to questions and creating a model.	• the history/story of why the names appear on the peaks in Glacier National Park mountains. • how to identify a type of mechanical weathering and see the outcome of erosion. • what features exist within a mountain range due to the past ice age; explain what occurs in a glacial period.

Stage 2 Assessment Evidence

Performance Tasks

Students will be grouped in two person teams and work as teams to locate glacial features with the color code as followed

Cirques (blue color code)
U-shaped valley(green color code)
Snowfield (red color code)
Cirque glacier (orange color code)

Assessment will be based upon "The Creative Process in Art, Science and Native American Cultures." Each individual student will express his/her own outcomes on his/her mountain model.

Assessment of progress made by students in developing a working understanding of the creative thought process as demonstrated on mountain model and also the insight of other students' shared knowledge (Greg Cajete Ph. D. Igniting The Sparkle, pg. 195, 197). Refer to the rubric below.

Other Evidence

Students will be organized into small groups. Students review to share each other's knowledge received or perceived. This is an indigenous model assessment closely related to cooperative learning.

Assessment Rubric: Traditional Educational Knowledge. Understanding and skilled application of the creative/science/art thought process as demonstrated through completion and presentation of an appropriate project. The rubric is designed to evaluate in three stages. Level 1: Shows little or no evidence connecting to lesson. Level 2: perceives lesson but doesn't demonstrate the whole task. Level 3: grasps lessons and shows understanding.

Science Grade 5 Tall Tales (Mechanical Weathering, Glacier Features, and Indigenous Mountain Names) (continued)

	Level 1, 70%-below	Level 2, 80% to 89%	Level 3, 90% to 100%
Introducing, exploring (discussion)	**Participant is unclear with objectives**	**Limited participant perception/interaction is evident**	**Participants are interacting with the objectives, Self meaning is apparent**
Explaining (information sharing)	**Participant is not engaged with principle concept**	**Some participants are engaged with principle concept**	**Demonstration of principle concept is evident**
Coaching (encouraging)	**Participants are not interacting with hands on exploration method**	**Participants are trying to connect to project**	**Participants show engagement with project**
Self explore (expression)	**Participant can't reflect experience from objective**	**Participants are trying to reflect /personalized experience from objectives**	**Participants are integrating with personal discoveries**

Stage 3 Learning Plan

Learning Activities: Students will develop their own model for visual learners, analyze a model for analytical intelligence, introspective from story told.

Day 1 - 45 min.
Read stories of mountains with names that have been given by Native peoples from *Place Names of Glacier National Park*, by Jack Holterman, Riverbend Publishing. Refer to excerpts for each of the following locations:

- **Red Eagle Mountain:** View an image of Red Eagle Mountain at: http://www.nps.gov/archive/glac/images/02025.jpg.
- **Chief Mountain:** View an image of Chief Mountain at: http://www.nps.gov/archive/glac/images/02818.jpg.

Day 2 - 45 min
Students will engage in a virtual tour of Glacier National Park

1. They will find mechanical weathering in photos from Web sites. Sites to use as a reference include:
   - www.nps.gov/archive/glac/home.htm
   - www.glacierparkphotos.com
2. Refer to the websites above to find pictures to point out each feature of mechanical weathering as follows:

Mechanical Weathering: ice wedges, release pressure, chemical weathering, abrasions from wind, plant action.
Day 3 - 60 min.
1. Students will research definitions of each glacial feature. The key terms are:
   - Cirques
   - U-shaped valley
   - Snowfield
   - Cirque glacier

Science Grade 5 Tall Tales (Mechanical Weathering, Glacier Features, and Indigenous Mountain Names) (continued)

2. Students will then make a model of a mountain landscape illustrating the different glacial features.
   - Pair-up two-person teams for this project.
   - Each team will take a plain white sheet of 11x8 1/2 paper and crumple into a ball.
   - Next partially unravel the paper you crumpled. This serves as your mountain model.
   - Use this model to illustrate a miniature mountain range.

3. Students will find glacial features in their own model.
   - Using the crumpled paper model, locate as many glacial features as you can find created by paper crumpling.

4. Glacier features (color coded)
   - Once you find the glacial features on the paper model, use water colors to identify the feature using the following color code:
     - ◊ Cirques (blue color code),
     - ◊ U-shaped valley(green color code),
     - ◊ Snowfield (red color code),
     - ◊ Cirque glacier (orange color code)

Resources
Internet
www.nps.gov/archive/glac/home.htm
www.glacierparkphotos.com

Ruap, O.B., Earhart, R.L., Whipple, J.W. and Carrara, P.E., 1983, "Geology Along Going to the Sun Road Glacier National Park, Montana"

"Igniting The Sparkle An Indigenous Science Education Model," by Gregory A. Cajete, Ph.D. 1999

Materials/Resources Needed
Computer with Internet access: Used for viewing mechanical weathering and viewing names of mountains.
"Place Names of Glacier National Park," By Jack Holterman, Riverbend Publishing

Mountain Model
- Plain white paper 11x81/2:
- water paints/markers: blue, green, red, orange

Definitions
Cirque = Carved out basin side of a mountain
U-shaped valley = area where glacier slowly moved through as it plows toward lower elevations
Snowfield = Existing glaciers that still currently move, and has an ice base.
Cirque glacier = slopes that still have glaciers within cavity

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Science Model Teaching Unit
Smallpox Epidemic

Created by Shirley Greene

Grades 6 and 7 - Approximate Duration: 50 minutes

Stage 1 Desired Results

Established Goals

Science Content Standard 3: Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.

Essential Understanding 1: There is a great diversity among the 12 tribal Nations of Montana in their languages, cultures, histories and governments. Each Nation has a distinct and unique cultural heritage that contributes to modern Montana.

Essential Understanding 6: History is a story most often related through the subjective experience of the teller. With the inclusion of more and varied voices, histories are being rediscovered and revised. History told from an Indian perspective frequently conflicts with the stories mainstream historians tell.

Understandings	Essential Questions
• Smallpox is a disease, which has not infected any humans since 1977. • Smallpox is a disease caused by a virus. • American Indians experienced a high mortality rate due to Smallpox. • Smallpox has changed human history.	• What are the symptoms of smallpox? • What is the treatment of smallpox? • What happened when an American Indian village became infected with smallpox? • How did the smallpox epidemics affect American Indian cultures?
Students will be able to… • determine the rate of possible deaths in an American Indian population infected with smallpox. • determine the percentage of actual deaths. • explain how having many people die in a village or tribe would affect the tribe members left behind.	*Students will know…* • smallpox is a disease caused by a virus. • smallpox has been eradicated • smallpox and other diseases have changed human history.

Stage 2 Assessment Evidence

Performance Tasks

Students will be assessed through engagement in a classroom discussion, responding to critical thinking questions, and mathematical calculations of a smallpox infection in a simulation.

Other Evidence

Students will be questioned individually.

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Stage 3 Learning Plan

1. Review what students know about smallpox.
2. Distribute the **Smallpox Worksheet** and have them complete #1-2 of the worksheet throughout the class discussion.
3. Show students a picture of a person suffering from smallpox (http://science.nationalgeographic.com/science/enlarge/smallpox-virus.html)
4. Discuss smallpox and its history.
5. Discuss "bottleneck" theory: people who survive epidemics might have a natural, genetic immunity to the disease and pass this on to their children. Populations which have been exposed to a particular disease over hundreds of years might not have as high a mortality rate as populations which have never been exposed.
6. Show a world globe/map to the students. What might have kept smallpox out of North and South America? (oceans) What might you expect to happen to populations that are exposed to smallpox for the first time? (high mortality) Why? (no immunity, no knowledge of disease)
7. What was one way Native peoples of North America became exposed to smallpox? Have students work, in pairs, through http://www.umass.edu/legal/derrico/amherst/lord_jeff.html. Instruct students to pay special attention to the sections beginning with "Smallpox blankets". Students should complete # 3 – 7, of the **Smallpox Worksheet** as they work in pairs.
8. Distribute information from the Centers for Disease Control and Prevention website, http://emergency.cdc.gov/agent/smallpox/overview/disease-facts.asp, or have students read the information from the website themselves. It may be good to have them do it individually, in pairs, or projected as a class.
9. Tell students that they are going to have a simulation of smallpox infecting the class. They are all going to be exposed to smallpox. Some will survive, and some will die.
10. Show container with cards inside it to students. Instruct them that they are to come up, choose one card, look at both sides, place the card on the table (so it doesn't go back into the container), and return to their seat.
11. After all students have chosen a card, have the students who had a blue circle on their card stand up. Record this number on the board. Then have the students that had a green circle stand up. Record this number on the board.
12. Explain that the cards with a blue circle signify that the student died of smallpox. The students who chose a card with a green circle "survived" smallpox.
13. Inform the students that there were 100 cards in the container, with 90 blue circle cards and 10 green circle cards. What was the percentage of blue circle cards in the container? (90%) Show students how to determine percentage if needed. (Note to teacher: If you have more than one class, return all cards to the container at the end of each class so that each class has the same beginning mortality probability.)
14. Have students determine the mortality rate (in percentage) for the classroom simulation.
15. Have a class discussion about the results of the simulation. Who is left? How would this affect a tribe?
16. Have students continue the **Smallpox Worksheet** and discuss the questions in groups as they do the work sheet. When all groups are done, discuss the work sheet questions as a class. Each student is to turn in an individual work sheet at the end of class.

Materials/Resources Needed

- 90 index cards with a blue circle drawn on each of them
- 10 index cards with a green circle drawn on each of them
- Work sheet : Smallpox Background and Effect on Native Americans
- Work sheet : Smallpox Work sheet
- World globe
- Container

Reference Web sites

- http://science.nationalgeographic.com/science/enlarge/smallpox-virus.html
- http://www.umass.edu/legal/derrico/amherst/lord_jeff.html
- http://emergency.cdc.gov/agent/smallpox/overview/disease-facts.asphttp://www.encyclopedia.com/topic/smallpox.aspx

Extensions

What has happened to the smallpox virus?
How could smallpox be used as a bioterrorist weapon?
What steps has the United States taken to protect the population from a smallpox epidemic?
Why did the United States stop giving vaccines to the population in the 1980s?
"History Mystery" (http://www.blm.gov/mt/st/en/prog/bcc/mystery.html)

Smallpox Worksheet Name_____

1. What is smallpox?

2. Why was smallpox so deadly to Native Americans?

3. Explain who Lord Jeffrey Amherst was. What was his role in the America's Revolution?

4. Explain Lord Amherst's perspectives regarding Native peoples.

5. Discuss and record your thoughts regarding the idea that Lord Amherst distributed smallpox infested blankets to Native people. Do you believe he did this? Why or why not?

6. What might have been Lord Amherst's motivation for doing what he did?

7. Are there documents that state Lord Amherst was responsible doing such a thing? Where are they located if they do exist? Does this alter your perspective regarding Lord Amherst's motives? Explain.

8. What was the mortality rate for the smallpox epidemic simulation in your class?

9. What would have happened to the survivors if all of the survivors were under the age of three?

10. What would have happened to the tribal members if all of the elders had died of smallpox?

11. How would you have felt if you were one of the survivors?

12. When the first astronauts came back from the moon, they were quarantined because of fears of possible viral or bacterial infection. It was found that the moon had no viruses or bacteria. Eventually, we will be sending astronauts to Mars. Should we isolate Mars' astronauts when they come back to Earth? Why or why not?

Montana
Office of Public Instruction
Denise Juneau, State Superintendent
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Science Model Teaching Unit
Dating Deep Blood Kettles

Created by Rod Benson
Modified by Colleen Daly Windell

Grades 6-8 - Approximate Duration: 135-180 minutes

Stage 1 Desired Results

Established Goals

Science Content Standard 6 Benchmark 8.1: Give examples of scientific discoveries and describe the interrelationship between advances and scientific understanding, including American Indian examples.

Essential Understanding 1: There is great diversity among the 12 tribal Nations of Montana in their languages, cultures, histories and governments. Each Nation has a distinct and unique cultural heritage that contributes to modern Montana.

Understandings	Essential Questions
• In planning bison kills some Native Americans took into consideration many factors and employed a variety of strategies. • Radiometric dating techniques can be used to establish when prehistoric events took place. • Carbon-14 is a radioactive isotope that can be used to determine when kill sites were used by Native Americans.	• What factors were taken into consideration in planning a bison kill? • What are some strategies used by some Native Americans to kill bison? • What types of evidence left at kill sites might help archaeologists learn about what took place there and when the site was used? • How does radiometric dating work? • How can radiometric dating be used to determine when kill sites were used?
Students will be able to… • Describe techniques that some Native Americans used to kill bison at kill sites. • List types of evidence left at kill sites. • Explain how radiometric dating can be used to determine when the kill site was used.	*Students will know…* • Key terms: pishkun, kill site, radioactive isotope, half-life, radiometric dating • How some Native Americans killed bison. • How evidence left at kill sites can be used to determine when the site was used.

Stage 2 Assessment Evidence

Performance Tasks

- Participate in two experiments/labs that simulate half-life.
- Collect data from their group and the class to complete a chart and graph on half-life.
- Read information on how prehistoric people hunted bison.
- Explore a website on Montana pishkuns.

Other Evidence

- Students will discuss in small groups and as a whole class their ideas on how early hunters killed large numbers of bison.

Stage 3 Learning Plan

Learning Activities

Day 1

1. Engage/Question: Ask students if our class were going to hunt a large group of animals that were 12.5 feet long, 6.5 feet tall at the shoulders, weighed 1,200-1,800 lbs, and ran at a top speed of 50 mph, how would we do this? We will be on foot and only have spears and bows and arrows to use. Have students write their initial responses in their notebook/journal.

2. After a few minutes, have students share their ideas in a small group. Discuss as a whole group, asking students to elaborate ideas that are not well developed.

3. Explore: Have students work in pairs to examine the following websites for background information about pishkuns: http://www.head-smashed-in.com/; http://www.browningmontana.com/ulmpishkun.html; http://www.trailtribes.org/greatfalls/buffalo-hunt.htm; http://formontana.net/jump.html. While gathering background information, students should pay particular attention to defining the following important terms and concepts: atlatl; bison; bow and arrow; buffalo jumps; pishkun (piskan or pishkin); Continental Divide; drive line; forbs; natural traps; short grass plains; spears; wooden corrals. Have students refer to a dictionary if they are not able to define a term.

4. Discuss how these ancient people used the limited resources they had to develop an ingenious way to kill large numbers of animals that were much bigger and faster than themselves.

5. This next part can be done as a whole class with discussion or in small groups:
Go to the following website: http://formontana.net/jump.html
Click on the "Unique Pishkun in Central Montana" link on this page. This page shows two unique pishkun found in Montana. Next, explore the "Radiocarbon Dating at Montana's Bison Kill Sites" link (found on the first page of the site listed above). This page focuses on the First Peoples Buffalo Jump site near Great Falls. It will provide the link between the first part of this lesson and the second part, which is Radiometric dating of organic remains. Again, go over the information either as a whole class or in small groups. Below are some questions that can be addressed as a written assignment or as a class discussion for both the website and the reading pages.

1. What are some other characteristics of the ideal buffalo jump?

2. What kinds of evidence might an archaeologist hope to find at kill sites today?

3. Experts claim that Indians used the cliffs of First Peoples Buffalo Jump (Ulm Pishkun) as a kill site from roughly 900 AD to 1500 AD. What scientific technique can be used to determine this?

4. How were drive lines used to hunt bison?

5. What was another way ancient hunters captured bison? Explain.

6. How did ancient people use natural traps to help them hunt bison and other animals?

Another interesting site is the Head Smashed In Buffalo Jump website. This site provides many pictures, a virtual tour of the site and additional information.

http://www.head-smashed-in.com/

Another site of interest is the Ulm Pishkun Buffalo State Park website. It also has a link to a great article from Montana Outdoors magazine (2003).

http://www.browningmontana.com/ulmpishkun.html

Day 2: Radiometric Dating

1. Engage: Explain to students that they will be engaging in an activity that will help them understand how scientists figure out how long ago these pishkuns were used.

2. Explore/Explain: Pass out the lab Understanding Half-life and the needed materials. Read through the introduction as a class. Before you start the lab explain the following to students:

- During carbon 14's half life, every carbon 14 atom has a 50-50 chance of decaying. That means that if we had 100 Carbon 14 atoms in a jar, after about 5,700 years about half of them would be Nitrogen and half would still be Carbon 14. That's where the "half" in half-life comes from. As a class, fill in the "Ideal or Mathematical Results" chart in the lab. To complete the "Number of Carbon-14 Atoms" column, you divide the number of Carbon-14 atoms you started with by 2. To complete the "Number of Years Ago" column, you add one half-life (5,700 years) to the number you started with (see answer sheet). Depending on the level of your students, you may want to use calculators.

3. After students have completed part 1 of the lab, explain that just as every Carbon-14 atom has a 50-50 chance to decay, every penny has a 50-50 chance of landing heads or tails. This next part of the lab will simulate a more realistic example of half-life. Have the students conduct Part 2 of the lab.

Day 3: Determining the age of Bison Bones Using Radiometric Dating
In this part of the lab, students will be building upon what they learned the day before.

1. Students will be using 128 cards instead of 100 pennies. This is much quieter and the number 128 can be divided evenly more times than 100.

2. When making the cards, the two "atom" sheets are copied back to back. Be sure they line-up before you cut them.

3. Engage: Explain to students that they will be doing another lab that will help them to see how scientists figure out how old something is using Radiometric dating, specifically Carbon-14.
Pass out the lab, Determining the Age of Bison Bones

4. Read through the background data together. Complete the data chart for half-life for this activity.

5. Go over the instructions for the lab. BE SURE THAT STUDENTS KNOW THAT THE DATES FOR THIS LAB ARE NOT ACCURATE. Most of the sites are less than one half-life old (5,700 years). This would be very difficult to demonstrate.

6. Have little cards with the names of the different pishkuns on them for each group. You can vary the number of groups to fit your class size. Either predetermine the number of half-lives you want each group to go through or have them randomly draw a number. You should check that each group knows and actually flip over the correct number of cards. This can be quickly determined using the chart that you construct as a group.

7. Have students do the lab.

8. When they are done, discuss their findings and clear up any misconceptions.

Teacher Planning/Preparation

- 100 pennies are needed for each group. These will need to be secured before the second lesson.
- Teacher will need to copy (and possibly laminate) the Carbon 14 cards before the second lesson.
- Appropriate number of computers for students to work in pairs to do research.
- Edit the group data chart in the Understanding Half-life lab to fit your class size.

Resource Websites
http://www.head-smashed-in.com/
http://www.browningmontana.com/ulmpishkun.html
http://www.trailtribes.org/greatfalls/buffalo-hunt.htm
http://formontana.net/jump.html

Materials/Resources Needed

Student journals or notebooks
100 pennies for each group of 3-4 students
Large plastic cups or jars to fill with 100 pennies
124 Carbon-14 cards for each group
Computer with internet access and projection device (one for the teacher and possibly up to one per student depending on if students will research independently or as a class).
Pages 1-3 of Ancient Teachings document (page 4 contains a list of terms that may also be used)
Understanding Half-life lab, one copy per student and a transparency to record class data
Determining the Age of Bison Bones, one copy per student and a transparency to record class data

Name _____

Understanding Half-life

Background Information:

By some estimates 60-75 million bison populated the plains of North America before Europeans began settling the area in the 1800s. Although the Plains Indians fished, gathered fruit and berries, grew some food, and hunted other animals, they relied on bison for the bulk of their food, and materials for making clothing, tools, and shelters.

Because of the bison's tremendous size and speed, Indians devised sophisticated strategies to kill large numbers of them simultaneously. One method was to drive them over cliffs at locations known as "buffalo jumps", and then finish off and process the animals near the base of the cliff. Archaeologists refer to these as "kill sites". Many prefer the Blackfeet word "pishkun," which (loosely translated) means "deep blood kettle".

Hundreds of kill sites are scattered throughout the northern plains (over 300 in Montana). "The First Peoples Buffalo Jump" (formerly known as Ulm Pishkun) and the "Madison Buffalo Jump" are two of the better-known ones in Montana, and the "Head-Smashed-In" site 40 miles north of Glacier Park is world famous. Archeologists have learned much about Indian cultures from evidence left at these sites.

One of the ways that scientists can figure out how long ago these sites were used by native people is to use a technique called **Radiometric Dating** or **Carbon Dating**. All living things contain an element called carbon. Most carbon contains 12 protons, neutrons, and electrons, but every once in a while a carbon atom contains 14 neutrons. This is called an "isotope". Some isotopes, such as **carbon 14**, are unstable, which means they break down or fall apart. When carbon 14 breaks down it turns into another element call Nitrogen. This breaking down process takes place at a steady rate. This is called radioactive decay or a "**half-life**". The half-life of carbon 14 is 5,700 years. That means it takes 5,700 years for half of the carbon 14 to decay or break down.

All living organisms have about the same percentage of carbon 14 because they constantly replace any that break down when they eat. When the organism dies, however, they stop replacing the carbon 14, and the percentage starts to go down. Scientist can figure out how long ago an animal died by looking at the percentage rate of carbon 14 that is left. This type of dating is only accurate for objects less than 50,000 years old.

The following activity will help you understand half-life.

Materials:

100 pennies
Large plastic cup

Procedure:

Part 1

1. With the teacher, complete the chart of the ideal or mathematical half-life.
2. Graph the results on the graph paper and connect the dots with a black pen.

Part 2

3. Place 100 pennies in the large cup. These pennies represent 100 Carbon-14 atoms.
4. Shake the pennies in the cup for a few seconds and then carefully pour them out so that they don't fall off the table. Spread them out so that they are not on top of each other. BE SURE TO NOT FLIP ANY OVER. This first shake represents the first half life of the isotope.
5. Carefully pick out the pennies that are "tails". These will represent the atoms that have decayed into Nitrogen. Put these pennies aside.
6. Count the number of pennies that are "heads" (Carbon-14 atoms) and record this in the Group Data Chart.
7. When asked, be prepared to tell how many "Carbon-14" pennies remain. This will be recorded in the Class Data Chart.
8. Repeat step 1-5 for the remaining "Carbon-14" pennies six more times. This will represent a total of 7 half-lives.
9. Determine the number of years ago each half-life represents.
10. Copy down the class data in your Group Data Chart.
11. Find the class average for each of the half-lives.
12. On the graph, plot the class's results for each of the half-lives. Connect the dots with a line in red pen.
13. Compare the class's results (red line) to the ideal results (black line).
14. Answer the questions in the Conclusion section.

Observation/Results:

Ideal or Mathematical Results

Number of Half-life	Number of Years Ago	Number of Carbon-14 Atoms
0	**0**	**100**
1	**5,700 years**	
2		
3		
4		
5		
6		
7		

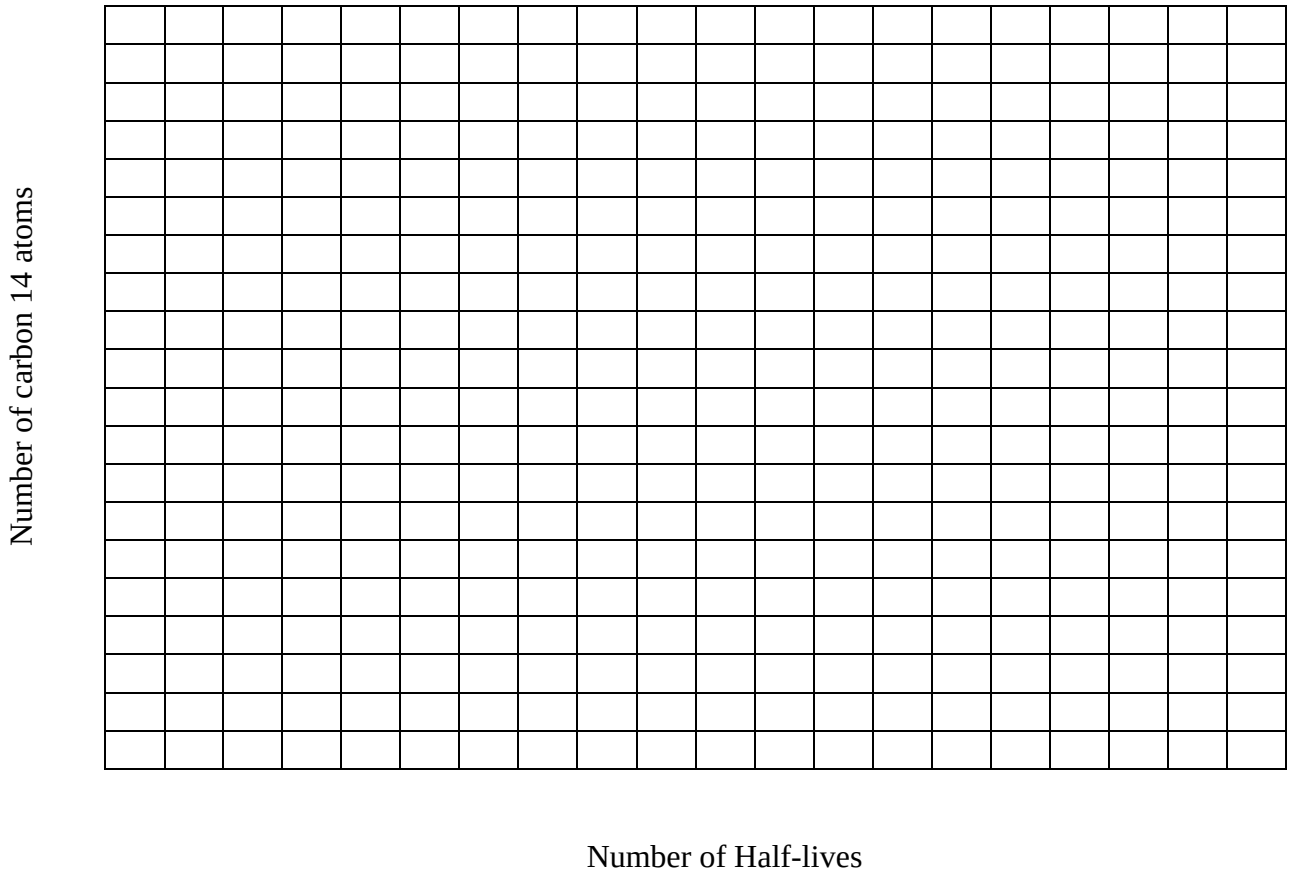
Group Data Chart

Number of Half-life	Number of Years Ago	Number of Carbon-14 Atoms
0	**0 years**	**100**
1		
2		
3		
4		
5		
6		
7		

Class Data Chart

Run	Number of Carbon-14 Pennies						Class Average
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	
0	100	100	100	100	100	100	100
1							
2							
3							
4							
5							
6							
7							

Carbon -14 Decay Graph



Conclusions:

How did the class's data (red line) compare to the idea results (black line)?

Based on the class's results, if there were about 6 pennies or Carbon-14 atoms left in our sample, how long ago or how old would our sample be?

Name _____

Determining the Age of Bison Bones

Background Information:

To date the bones of Bison, scientists take small samples of the bone and grind them up into a fine powder. They remove the carbon from the rest of the sample. They place this in a very specialized machine that counts all the regular carbon and compares it to the number of remaining Carbon 14 atoms.

When scientists date the bones found in the pishkuns, they are looking at very large numbers of atoms. In our lab, we are using much smaller numbers so that we can easily count the cards or pennies. Scientist also use a more complicated formula to find the exact age (or close to it) of the bison bones. We are using a much simpler way.

Materials:

128 C-14/N-14 cards
Index cards with number of half-lives
calculators

Procedure:

1. As a class, fill in the half-life chart below.

Number of Half-lives	Number of C-14 Cards	Number of N-14 Cards	Years Ago
0	**128**	**0**	**0**
1			
2			
3			
4			
5			

2. Take out your cards. Place them on the table with the C-14 side facing up.
3. The teacher will give you an index card that tells you how many half-lives your team will perform.
4. You will have 1 minute to flip over half of the cards so that the N-14 side shows.
5. Repeat step 3, if your index card says you should. The class will go through a total of 5 trials, but not all groups will be doing the same number of half lives. If you have only a 1-4 on your card, just pretend to flip the cards over.

6. Your table will be given the name of a pishkun. Fill out your data chart with the number of half-lives your group went through. Determine the age of your bison bones using the chart the class did together. ***Note: these numbers are made up for this activity.*** These pishkun are not as old as the activity show. It would just be much harder to show the actual dates.
7. Exchange places with another group.
8. Count up the number of C-14 cards and N-14 cards. Fill in the data chart for that pishkun.
9. Repeat steps 7-8 until you have visited each pishkun.
10. Determine how old the bison bones would be based on the number of half lives. Complete the data chart below.

Observations:

Pishkun Data

Name of Pishkun Site	Number of C-14 Cards	Number of N-14 Cards	Age of Site
Head Smashed In Buffalo Jump			
Madison Buffalo Jump			
First Peoples Buffalo Jump			
Wahkpa Chu'gn			
Belt Meteor Crater			
The Monarch Sink			

Answer keys:

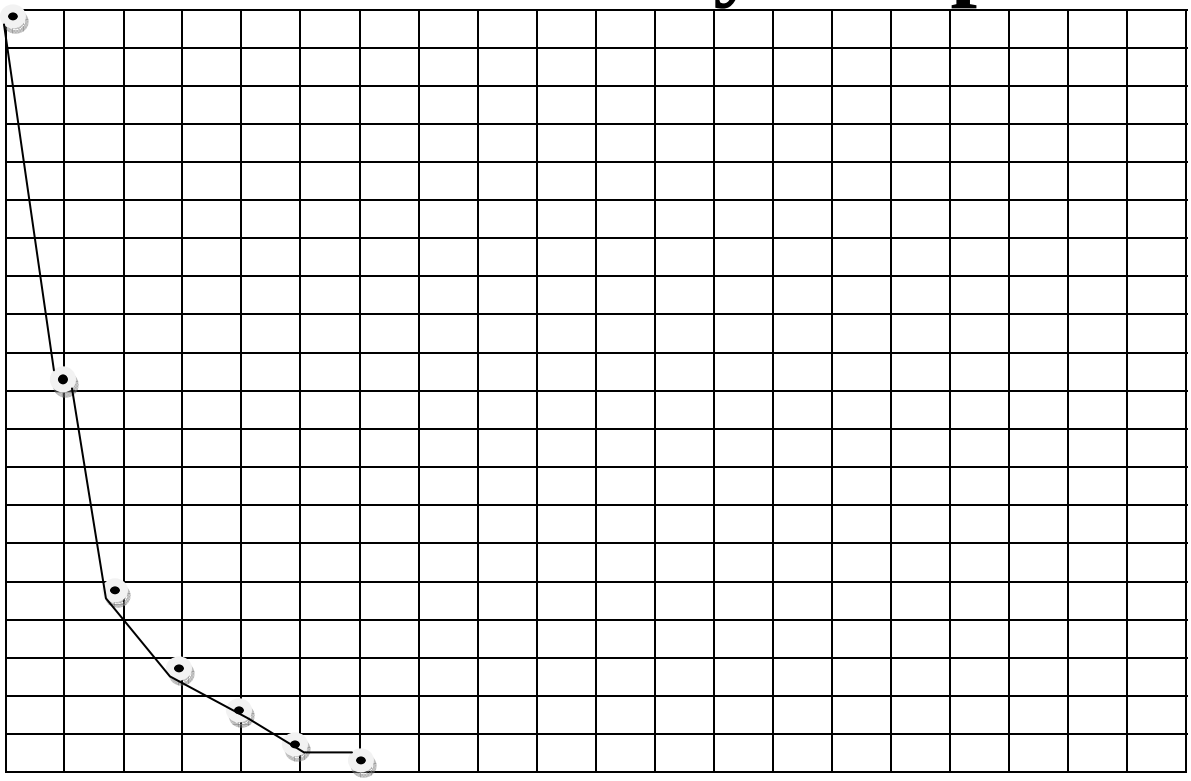
Understanding Half-life

Observation/Results:

Ideal or Mathematical Results

Number of Half-life	Number of Years Ago	Number of Carbon-14 Atoms
0	0	100
1	5,700 years	50
2	11,400 years	25
3	17,100 years	12.5
4	22,800 years	6.25
5	28,500 years	3.125
6	34,200 years	1.5
7	39,900 years	.75

Carbon -14 Decay Graph



Conclusions:

How did the class's data (red line) compare to the idea results (black line)?
The class's data should match this curve pretty closely.

Based on the class's results, if there were about 6 pennies or Carbon-14 atoms left in our sample, how long ago or how old would our sample be?
This would be about 22,800 years ago.

Determining the Age of Bison Bones

Number of Half-lives	Number of C-14 Cards	Number of N-14 Cards	Years Ago
0	128	0	0
1	64	64	5,700
2	32	96	11,400
3	16	112	17,100
4	8	120	22,800
5	4	124	28,500

Montana
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Science Model Teaching Unit

Where Have All the Bison Gone? Ecology and Population Investigation

Modified from lessons written by Jeff Grom and Colleen Windell

Grade 6-8 - Approximate Duration: Four 50 minute class periods

Stage 1 Desired Results

Established Goals

Science Content Standard 3 Benchmark 8.4: Investigate and explain the interdependent nature of populations and communities in the environment and describe how species in these populations adapt by evolving.

Essential Understanding 1: There is great diversity among the 12 tribal Nations of Montana in their languages, cultures, histories and governments. Each Nation has a distinct and unique cultural heritage that contributes to modern Montana.

Essential Understanding 6: History is a story most often related through the subjective experience of the teller. With the inclusion of more and varied voices, histories are being rediscovered and revised. History told from an Indian perspective frequently conflicts with the stories mainstream historians tell.

Understandings	Essential Questions
Students will understand… • how bison populations were devastated by western expansion. • how to construct, read, compare and analyze different population graphs. • How the diets of most tribes of Montana included bison and how its demise affected the futures of some tribes.	• How was the bison population decimated in such a short time? • How does the bison population graph compare with a typical population graph? • Why was the bison important in the traditional diets of many tribes of Montana?
Students will be able to… • construct, read, compare and analyze population graphs. • compare and contrast the traditional diets of tribes of Montana	*Students will know…* • the difference between a typical population graph compared to a graph not adhering to typical population cycles. • how the demise of the bison affected some Native American peoples and their future.

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Montana Office of Public Instruction
Denise Juneau, Superintendent

Stage 2 Assessment Evidence

Performance Tasks

- Construct a bison population graph from provided data. Compare/contrast and analyze the graph with a typical population graph.
- Based on provided information, determine some of the reasons for the loss of the bison population and its affect on the Native peoples that used it. Present to class the top three reasons for the bison population crash.
- Use internet resources to research the traditional diets of specific tribes of Montana. Compare and contrast the traditional diets of tribes of Montana.

Stage 3 Learning Plan

This series of lessons assume that the students have some background in animal populations. If students don't have any experiences in these areas, the teachers will need to spend more time developing these concepts.

Learning Activities

Day 1

1. Establish a Question/Elicit ideas: Hand out the Moose Population graph or project it so that all students can see the graph. Explain to students that this is the population of moose on the Isle Royal in Michigan on Lake Superior. Ask them: Why do you think the population fluctuates (goes up and down) so much? Have students write in their science notebook/journal. After a few minutes, have students share their ideas with their small group. They may add to their reasons in their notebook/journal.

2. After students have had time to discuss, have groups share their ideas with the whole class. Write their ideas on the board. Students should bring up issues such as: predators, bad/good weather, increase/decrease of food, disease, habitat destruction immigration; emigration, and hunting (predators).

3. Explain: Explain to students that this is an example of a typical prey population graph. Scientists expect populations to increase and decrease overtime when there are predators in the area. This island had wolves on it. Other factors, such as food, weather, and disease also affect populations.

4. Engage/Explore: Tell students that they are now going to construct their own population graph. Hand out the data on Bison population that you have listed (refer to http://geography.unco.edu/Biodiversity/Unit2/Unit_2.pdf, page 45, #4) but don't tell students what animal they will be dealing with. Have students look at the data chart. Point out that the populations go from the millions to the thousands. This cannot be graphed in the typical way.

5. You can show students exactly how big their graph paper would have to be if they made it the regular way by going outside. Have each student bring with them a metric ruler with millimeters on it. Depending on your time constraints, either measure out 60 meters before hand, or have students measure using meters sticks, measuring tape or a trundle wheel. Show them that if they made one millimeter (one tiny mark on their ruler) equal one thousand bison, they would need a paper 60 meters long to represent 60,000,000 bison.

6. Once you are back inside, show students how they will have to construct their graphs so that they can have all the numbers on there at the same time. They will have to split the graph twice to graph the millions, hundred thousands and thousands. See the sample graph on how to do this. Students may need help dividing up the time evenly across the x-axis (horizontal side of graph). They can add another sheet of graph paper to the right side to make the paper longer.

7. Have students construct their graphs.

8. Once students are done constructing the graph, have them compare their new graph to the graph of the moose population. The difference will be very obvious. As a class discuss the differences.

9. Establish a Question/Elicit Ideas: What could have caused this population to change so dramatically over 300 years? Again, have students write their initial impressions in their notebooks/journals. Have them share their ideas with their group. As a class, list all the possible ideas on the board or paper (to keep).

10. At this time, share with students that this is a population graph of bison. Have students add any additional ideas they may have to the list of ideas generated.

11. Explore: Create a worksheet from the timeline of information the National Bison Society provides or project their website (http://www.americanbisonsocietyonline.org/BisonTimeline/tabid/308/Default.aspx) for the students to use.

12. Working in pairs, have students add these events to the bottom of their graph on a timeline that mimics the dates on the graph. Attaching another piece of graph paper below the original graph may help. See sample. Depending on the level of your students, they may need some help doing this. You may want to do the first few together so that students get the idea.

13. Once students have most or all of the events plotted on the timeline, have them revisit the question, what could have caused the bison population to change so dramatically over the 300 year span. Have students look for events that coincide with major drops in population. Have them decide in small groups which factors seem to have the biggest effects. Have students determine their top 3 reasons. They will need to make a poster that supports and defend their reasons which they will present to the class in a 3-5 minute presentation.

Day 2

1. Establishing a Question/Elicit Ideas: Ask students what they think tribes of Montana used the bison for. Have students write their answer in their notebook/journal. When they are done, have them share their answers with their group. Students can add additional ideas to their original lists.

2. After a few minutes, have groups share out their ideas.

3. When the class is done discussing their ideas on the uses of bison, provide materials that list the uses of the bison. A great resource is: http://www.saskschools.ca/~gregory/firstnations/bison.html. This website provides a list and a diagram that can be downloaded and shared. It also provides several hunting techniques. This is not tribal specific, however, but focuses on the Northern Plains Indians. You can also find information related to specific tribes of Montana at www.trailtribes.org and www.montanatribes.org.

4. Explain: Explain that many Great Plains Indian tribes including the Blackfeet, Sioux, Assiniboine, and Crow, were nomadic, meaning they followed the bison herds. They relied heavily on the bison for a great deal of their food, clothing, shelter, and weapons.

5. Explore/Investigate: Tell students that they are going to compare and contrast the traditional diets of various tribes of Montana. Explain that the food that was available was specific to the location of the tribe. A tribe from western Montana may not have the same berries and roots available to those that lived in eastern Montana. Pass out the research collected or have students research the food eaten by specific tribes in Montana. Have each group research the diets of different tribes so that the class can look for similarities and differences. The following are great resources:

www.trailtribes.org; http://www.trailtribes.org/greatfalls/home.htm; www.montanatribes.org; http://www.montanatribes.org/links_&_resources/films.html-

6. Once students have compiled lists of the traditional foods eaten by the tribe they have researched, they should have the opportunity to share their information with the rest of the class.

7. Establishing a Question/Elicit Ideas: After students have compared the lists of traditional foods of each tribe, pose the question: What do you think happened to the tribes in the eastern part of the state when the bison disappeared?

8. Have students write their ideas in their notebooks/journals. After a few minutes, have them share in their small groups. Discuss the idea as a class.

Optional Addition

9. Download and show the movie, "Native Americans: Contact and Conflict" from Discover Learning/United Streaming at http://streaming.discoveryeducation.com/. It takes 27 minutes and gives a rundown of white and Indian contact and conflicts. One segment focuses on the Plains Indians and the bison.

10. After the movie, talk to students about how you didn't show the movie to make them feel bad, but to show them the mistakes of the past. Many non-Indian students will feel depressed about how the white treated Native people. They may need reassurance that they are not to blame for what happened long before they were born, but they need to know the truth about what happened so that similar things don't happen in the future.

Teacher Planning/Preparation

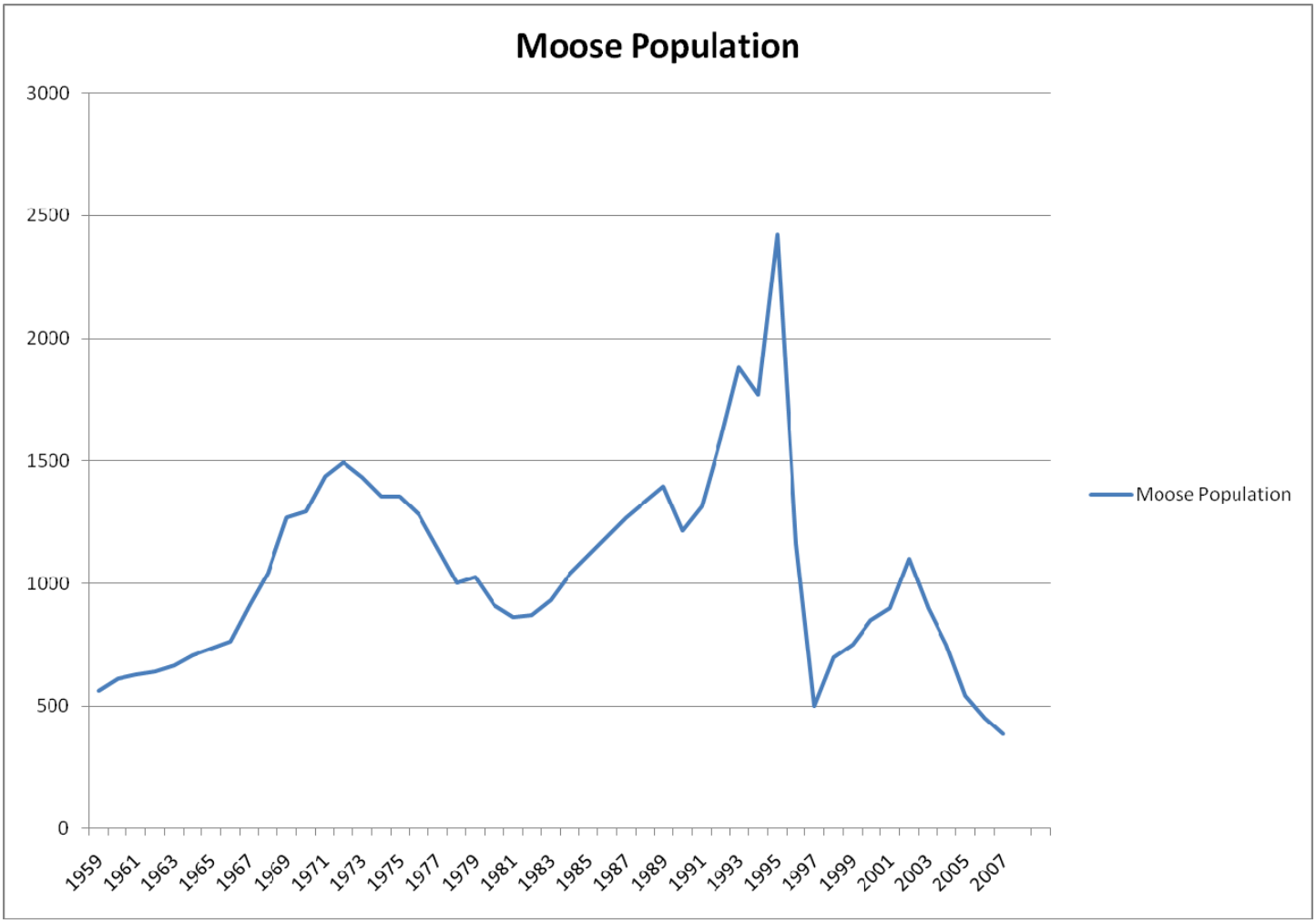
The teacher will need to find an area that is at least 60m long. This can be measured out ahead and marked or allow students to do this as a class.
Create a list of data on the bison population, which can be found in question #4, page 45 at http://geography.unco.edu/Biodiversity/Unit2/Unit_2.pdf.
Download and print the information about bison http://www.saskschools.ca/~gregory/firstnations/bison.html, you can also find information about bison at www.trailtribes.org and www.montanatribes.org.
Download information on traditional diets of different Montana tribes if you are not going to have students do the research. You may find information at www.trailtribes.org, www.montanatribes.org, and each of the websites of each of Montana's tribes (click on the reservations at http://www.opi.mt.gov/IndianEd2/Index.html to go directly to the tribal websites) and tribal colleges (http://www.opi.mt.gov/indianed2/IEFALinks.html).
If you have access to Discovery Learning, United Streaming, download the movie, Native Americans: Contact and Conflict at http://streaming.discoveryeducation.com/.

Materials/Resources Needed

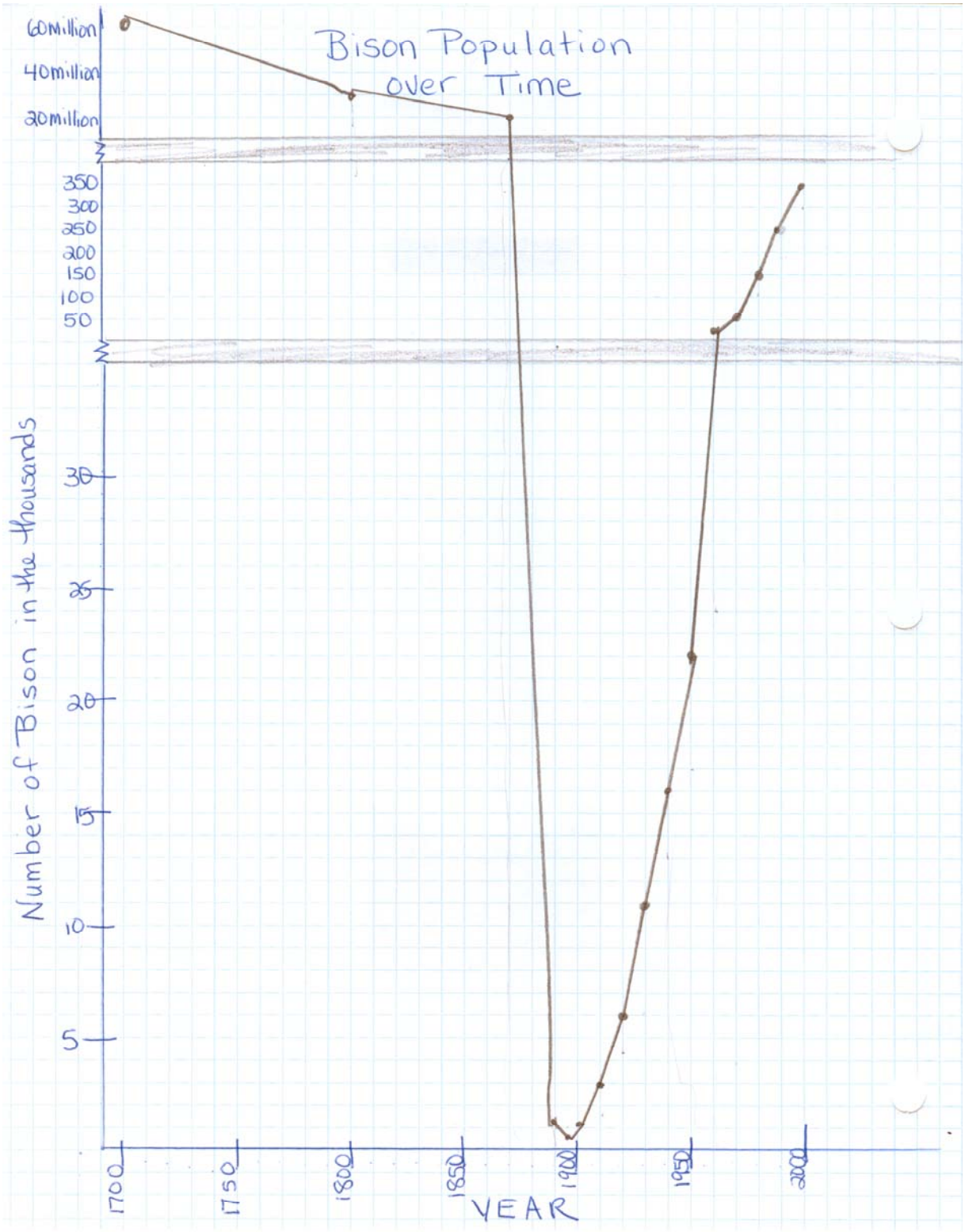
Large outside area of at least 60 meters
Meter sticks or trundle wheels (several for the class)
Metric rulers (one per student)
Student notebooks or journals (paper can also be used if students don't keep one)
Moose population graph, one copy per group or one projected for class
Graph paper, enough for 4 sheets per student
Timeline of Events Related to Bison sheet, one for a pair of students
Use of Bison information, see suggestions
Poster board for each group
Access to the internet for research, one for the teacher or one per small group.
Computer with projection screen

Resources and Worksheets

Following pages



Graph created from data available online, from: The Big Bad (?) Wolf Predator and Prey: The Wolves and Moose of Isle Royale, http://www.wolfmoose.mtu.edu/C.Hill_BigBadWolf.pdf



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